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Support to the implementation of the 1995 FAO Code of Conduct for Responsible Fisheries

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Support to the implementation of the 1995 FAO Code of Conduct for Responsible Fisheries

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PREPARATION OF THIS CIRCULAR

This Circular has been prepared within the framework of the Regular Programme as part of the ongoing activities of the Fisheries Information, Data and Statistics Unit (FIDI) aimed at improved access to fisheries information. The Circular was prepared in collaboration with the International Institutions and Liaison Service (FIPL) and focuses on the role of information in support of implementation of the FAO Code of Conduct for Responsible Fisheries. The observations and recommendations are based on professional interaction and communication with colleagues in developing countries, site visits, extensive review of the literature, and surveys of information users. Ms Janet Webster is the head librarian at the Marilyn Potts Guin Library, Hatfield Marine Science Center at Oregon State University in Newport, Oregon. She carried out part of the research for this Circular during four months spent at FAO in 2004 on the Visiting Experts Programme.

The views expressed in this report are not necessarily those of FAO or Oregon State University. The following are acknowledged for their participation in the surveys, case studies and discussions: staff of the FAO Fisheries Department, in particular David Doulman for his input on implementation of the Code. From other organizations: Judith Swan, Susan Hanna, Jaqueline Alder, Charles Boyd, John Kurien, Yasuhisa Kato, Geoffrey Salanje, Margaret Ngwira, Emmanual Kaunda, Gift Kadzamira, Sloans Chimatiro, Simon Wilkinson, Amady Sow and staff of the International Collective in Support of Fishworkers.

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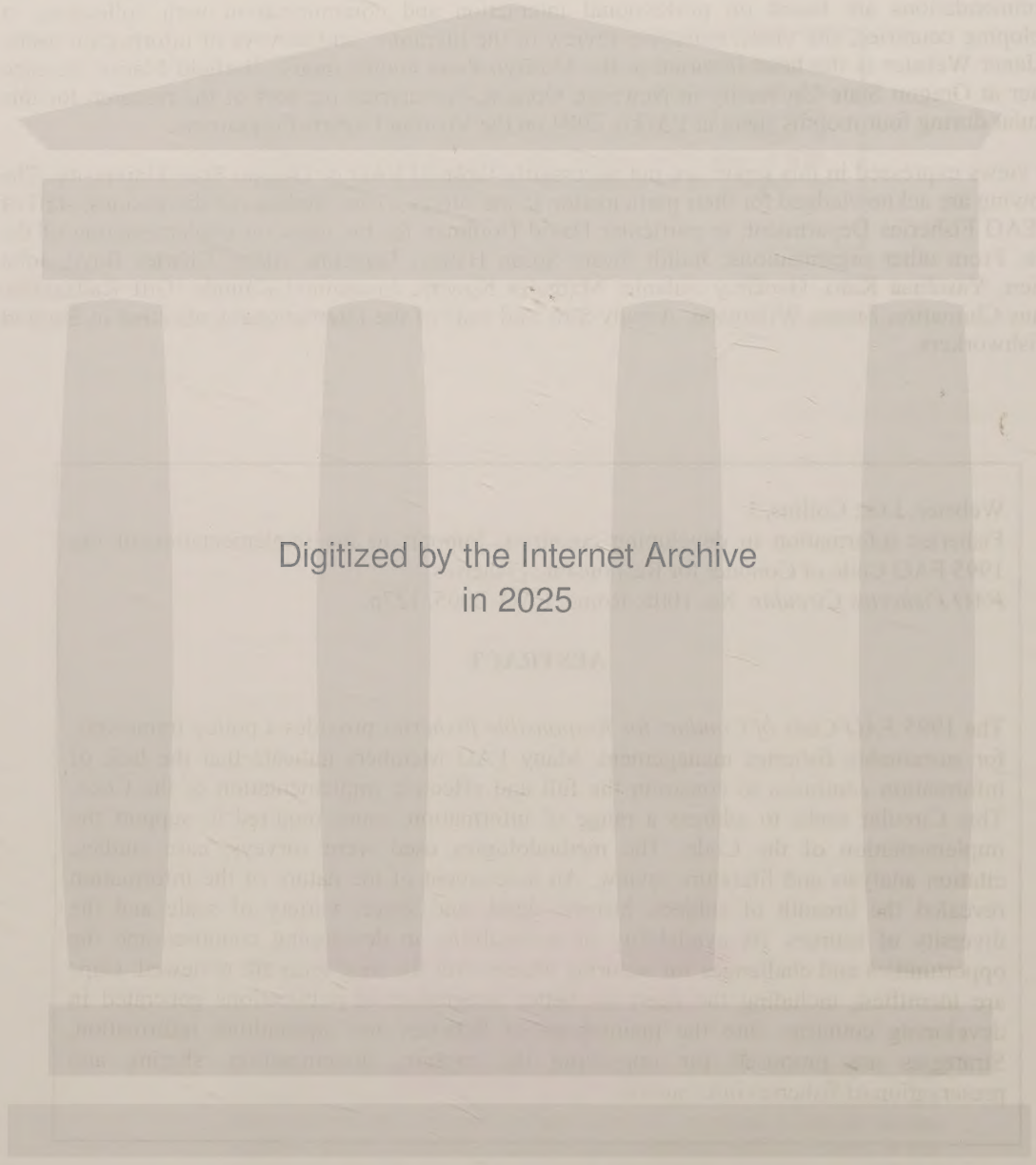
ABSTRACT

The 1995 *FAO Code of Conduct for Responsible Fisheries* provides a policy framework for sustainable fisheries management. Many FAO Members indicate that the lack of information continues to constrain the full and effective implementation of the Code. This Circular seeks to address a range of information issues required to support the implementation of the Code. The methodologies used were surveys, case studies, citation analysis and literature review. An assessment of the nature of the information revealed the breadth of subject, historic depth and space, variety of scale and the diversity of sources. Its availability or accessibility in developing countries and the opportunities and challenges for securing access over the long term are reviewed. Gaps are identified, including the need for better integration of publications generated in developing countries into the mainstream of fisheries and aquaculture information. Strategies are proposed for improving the capture, dissemination, sharing and preservation of fisheries information.



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FOREWORD

Implementation of the 1995 FAO Code of Conduct for Responsible Fisheries: Information needs and constraints

by
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The purpose of the 1995 FAO Code of Conduct for Responsible Fisheries (the Code) is to secure structural change in the fisheries sector[1] so that resources are harvested and utilized in a rational manner. The Code envisages that governments, working in partnership with stakeholders, would seek to facilitate long-term sustainability in the sector and, at the same time, instil a greater sense of responsibility on the part of all persons involved in fisheries. Similarly, through their participation in regional fishery bodies or arrangements (RFBs) the Code urges States to pursue equivalent goals for the conservation and management of international fisheries.

A range of actions are foreseen by governments, organizations and stakeholders (including fishing communities) to implement the Code. In 1995 the FAO Conference, in adopting the Code, called upon States (irrespective of whether they were FAO Members), international organizations whether governmental or non-governmental and all those involved in fisheries to collaborate in the fulfilment and implementation of the objectives and principles contained in the Code. This appeal from the Conference was interesting in itself in that it went beyond the FAO Membership, the conventional focus of FAO resolutions.

In promoting the full and effective implementation of the Code, governments have a pivotal role to play. Governments, as custodians of national resources for society at large, are expected to:

- provide a policy and legal framework, a so-called enabling environment, that reflects the spirit and intent of the Code, and
- take action to implement the Code consistent with that framework.

Stakeholders are encouraged to support and comply with the policy and legal framework, which ideally should be developed inclusively, involving their participation.[2]

Underpinning the Code's implementation, as explicitly recognized in its substantive articles (articles 7 to 12), is the need for two broad categories of information. These are:

- general information about the Code, its goals, coverage, etc., and
- specialized and technical information of a research nature required to permit officials and stakeholders to make informed decisions about options and approaches for the implementation of the Code.

Making mention of these two types of information needs may appear simplistic. However, many fisheries administrators, scientists, industry representatives and stakeholders, particularly in developing countries, are disadvantaged because access to information is limited. Many of these

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[1] As appropriate, fisheries include aquaculture.

[2] Some fishery administrations are reluctant to promote inclusive approaches to management and a more visible and active Non Governmental Organization role even when it is demonstrated that such approaches are more efficient in implementing the Code. This reluctance occurs because administrations often view broader participation as eroding their authority and role in management. However, inadequate stakeholder participation has been identified by some FAO Members as being a major constraint to the Code's implementation.

technicians and stakeholders are aware of the Code but have not actually seen a copy of it.[3] Access via the Internet to the Code and the information needed in support of its implementation is still not an option for many communities, especially those located outside urban areas. Facing the constraint of lack of access to basic information, they are not well placed to promote the implementation of the Code.

Identifying the specific national, regional and international information needed to support the implementation of the Code is beyond the scope of this paper. However, many of the general needs were identified by the drafters of the Code, some of which include:

- the need to collect and exchange information (sub-article 7.3.4);
- review management measures in the light of new information (sub-article 7.6.8);
- maintain information on fishers (sub-article 8.1.8);
- provide information to fishers on the most important provisions of the Code (sub-article 8.1.10);
- communicate information on fishing vessel accidents to the IMO (sub-article 8.2.10);
- collect and forward information for stock assessment to management bodies (article 8.4.3);
- make available information on new gear developments and requirements to fishers (article 8.5.1);
- base aquaculture on the best information available (article 9.1.2);
- establish databases and information networks to collect, share and disseminate data related to aquaculture (article 9.2.4);
- provide timely information on adverse trans-boundary environmental effects including prior notification to potentially affected States (article 10.3.2);
- sufficient information and time should be given to States and producers to permit them to adjust to changes in trade arrangements (article 11.3.4);
- collect, disseminate and exchange information on international trade through national institutions and international organizations (article 11.3.7);
- initiate scientific research to fill information gaps (article 12.3), and
- promote capacities of developing countries to collect and analyse data, information, science and technology, human resource development and provision of research facilities so they can participate effectively in the conservation, management and sustainable use of living aquatic resources (article 12.8).

This rather extensive, although probably not exhaustive, list illustrates the scope and depth of the information needed by governments, institutions, industry and stakeholders to implement the Code. Many governments, especially those in developing countries, face difficulties in the elaboration of fishery policy and legal frameworks that accord with the Code because they do not have access to basic information. Lack of information also limits their research capacity to elaborate sustainable approaches to fisheries management and utilization. Some of these governments, in the absence of basic and up-to-date information, are hard pressed to make decisions to facilitate the implementation of the Code and the many other regional and international fishery instruments that have been concluded since the 1992 United Nations Conference on Environment and Development (UNCED). These countries are now facing what has been termed in the literature "instrument-implementation fatigue" and as a result are not supportive of emerging initiatives that involve the conclusion of new instruments.

In reporting on information-related constraints in their efforts to implement the Code some FAO Members have reported to the FAO Committee on Fisheries (COFI) that they are handicapped by:

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[3] At the November 2003 FAO Regional Workshop on the Elaboration of National Plans of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing in East Africa some participatants received for the first time copies of the Code of Conduct and related documents.

- lack of awareness by stakeholders (including officials) about the Code and what it means for fishing communities leading to a lack of cooperation and irresponsible behaviour, persistent IUU fishing;
- insufficient information and a lack of access to hard-copy and electronic information to support and sustain implementation including the under-utilization of the media to disseminate information about the Code;
- inadequate public access to information and awareness programmes about the Code;
- lack of adaptation of the Code to meet local community and fishery needs;
- limited copies of the Code, related instruments and technical guidelines for general distribution, and
- lack of availability of Code documents in local languages.

To address these information-based constraints FAO Members have proposed:

- additional and more effective educational outreach including training and the mounting of meetings to disseminate information about the Code to officials and other stakeholders;
- greater and more active involvement of stakeholders through the adoption of participatory approaches especially in fisheries management;
- wider presentation of the Code at national and international fishing industry events;
- translation of the Code in local languages to facilitate its wider and deeper penetration in fishing communities and as a means of creating greater awareness about the concepts of "responsibility" and "sustainability";[4]
- ensuring that adequate copies of the Code, its related instruments and technical guidelines are available in country, and
- increased use of audio and visual means to disseminate information about the Code.

The dissemination of the Code is constrained at two levels:

- information about the Code and its purpose may not be transmitted effectively from central points (FAO headquarters, regional and subregional offices) to national fishery administrations, institutions, industry and NGOs. This constraint constitutes a "gap" in the information available to administrations, industry and stakeholders,[5] and
- information about the Code, if it is received by national administrations and stakeholders, sometimes encounters vertical and horizontal distribution bottlenecks as information is not disseminated within administrations or shared with other institutions, industry and stakeholders. This is a lateral access problem stemming from "turf" protection and often general reluctance of some officials to share information.

Operating in a dynamic environment, ongoing challenges for international organizations, governments, industry and stakeholders concerning the implementation of the Code and related policy and legal frameworks are:

- securing quality, reliable and complete information on an on-going basis, and
- channelling this information into the hands of the "right" policy-makers and stakeholders so that decisions are premised on sound information.

Frequently, the information received in national administrations, especially in developing countries, is from biased and unreliable sources (e.g. foreign fishers who provide fish price data for the calculation of access agreements). This situation leads to inappropriate and wrong decisions, many of which are likely to be fundamentally irresponsible. As they seek to broaden and deepen their efforts to

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[4] The Code is available in more than 60 languages.

[5] FAO is aware of this problem in accessing information about the Code and, within available resources, has taken steps to remedy it.

implement the Code and to minimize the impact of information gaps and bottlenecks on these efforts, governments, industry and stakeholders also need to focus on the exchange of information and to collaborate with countries facing similar fisheries problems.

This Circular seeks to address a range of information issues to support implementation of the Code. It considers these issues at three levels:

- the breadth, depth, scale and complexity of information required;
- its availability or accessibility in developing countries, and
- the opportunities and challenges for securing access to the required information over the long term.

In its review of issues, the Circular focuses on the formal (i.e. institutional and organizational) information needs that are required to support the implementation of the Code. Other information needs, while recognized to be critical for the Code's implementation (e.g. for fishing communities), are mentioned in the paper but are not considered in detail. The opportunities identified and strategies suggested are targeted in particular towards fisheries libraries and information centres, their parent institutions and external funding agencies and partners supporting the collection and dissemination of fisheries information.

2005 marks the tenth anniversary of the unanimous adoption of the Code by the FAO Conference. Biennial reports made to FAO by Members, RFBs and NGOs for the past four Sessions of COFI indicate that the lack of information continues to constrain the full and effective implementation of the Code. FAO is cautiously optimistic that good progress is being achieved in the implementation of the Code. However, addressing the financial, capacity and information constraints in developing countries in a more comprehensive manner would hasten the rate and scope of implementation.

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ACRONYMS

ABAFR	Aquatic Biology Aquaculture and Fisheries Resources
ACP-EU	African, Caribbean and Pacific Group of States and the European Union
AFRIAMSLIC	Africa Regional Group of IAMSLIC
AGORA	Access to Global Online Research in Agriculture
AGRIS	International Information System for Agricultural Sciences and Technology
AJOL	African Journals Online
ASFA	Aquatic Sciences and Fisheries Abstracts
ASFIS	Aquatic Sciences and Fisheries Information System
CABI	CAB International
CARICOM	Caribbean Community
CRFM	CARICOM Regional Fisheries Mechanism
CCRF	Code of Conduct for Responsible Fisheries
CD-ROM	Compact disc read-only memory
CDS/ISIS	Computerized Documentation Service/Integrated Set of Information Systems
CIFA	Committee for Inland Fisheries of Africa
COFI	Committee on Fisheries
CSIR	Council of Scientific and Industrial Research
DOAJ	Directory of Open Access Journals
eIFL	Electronic Information for Libraries
eJDS	Electronic Journals Delivery Service
FAO	Food and Agriculture Organization of the United Nations
FDI	Fonds documentaire de l'IRD
FIGIS	Fisheries Global Information System
FIRMS	Fishery Resources Monitoring System
FISON	Fisheries Society of Nigeria
GAINS	Ghana Agricultural Information Network Systems
GESAMP	Group of Experts on the Scientific Aspects of Marine Environmental Protection
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
HTML	Hypertext markup language
IAMSLIC	International Association of Aquatic and Marine Science Libraries and Information Centers
IAHS	International Association of Hydrological Services
ICCAT	International Commission for the Conservation of Atlantic Tunas
ICEIDA	Icelandic International Development Agency
ICES	International Council for the Exploration of the Sea
ICSF	International Collective in Support of Fishworkers
ICT	Information and communication technology
ICTP	International Centre for Theoretical Physics
IDRC	International Development Research Centre
IFLA	International Federation of Library Associations
IFREMER	Institut français de recherche pour l'exploitation de la mer
IFS	International Foundation for Science
IMO	International Maritime Organization
IMROP	Institut mauritanien de recherches océanographiques et des pêches
INASP	International Network for the Availability of Scientific Publications
IOC	Intergovernmental Oceanographic Commission
IOTC	Indian Ocean Tuna Commission
IPOA	International Plan of Action
IRD	Institut de recherche pour le développement
ISI	Institute for Scientific Information
ITU	International Telecommunication Union
IUU	Illegal, unregulated and unreported
JICA	Japan International Cooperation Agency

KMFRI	Kenya Marine and Fisheries Research Institute
LAN	Local area network
LARReC	Living Aquatic Resources Research Centre
LIFDC	Low Income Food Deficit Countries
LUC	Limburg University Centrum
MALA	Malawi Library Association
MALICO	Malawi Library and Information Consortium
MARC	Machine Readable Catalogue
MOFR	Marine, Oceanographic and Freshwater Resources
MRC	Mekong River Commission
NACA	Network of Aquaculture Centres in Asia-Pacific
NGO	Non-governmental organization
NIFFR	National Institute for Freshwater Fisheries Research
NISC	National Information Services Corporation
NISC SA	National Information Services Corporation South Africa
NOAA	National Oceanic and Atmospheric Administration
OCLC	Online Computer Library Center
ODINAFRICA	Ocean Data and Information Network for Africa
OPAC	Online Public Access Catalogue
OSI	Open Society Institute
PDF	Portable Document Format
PERI	Programme for the Enhancement of Research Information
RECOSCIX-WIO	Regional Co-operation in Scientific Information Exchange - Western Indian Ocean
RFBs	Regional fishery bodies or arrangements
SABINET	South African Bibliographic and Information Network
SADC	Southern African Development Cooperation
TWAS	Third World Academy of Sciences
SADC IFSTCU	SADC Inland Fisheries Sector Technical Coordination Unit
SAIAB	South African Institute for Aquatic Biodiversity
SciELO	Scientific Electronic Library Online
SEAFDEC	Southeast Asian Fisheries Development Centre
SEAFIS	Southeast Asian Fisheries Information System
SFA	Seychelles Fishing Authority
SFLP	Sustainable Fisheries Livelihoods Programme
SOFIA	State of World Fisheries and Aquaculture
SPC	Secretariat of the Pacific Community
STREAM	Support to Regional Aquatic Resources Management
TEEAL	The Essential Electronic Agriculture Library
UNCED	United Nations Conference on Environment and Development
UNESCO	United Nations Educational, Scientific and Cultural Organization
VSAT	Very small aperture terminal
WAICENT	World Agricultural Information Centre / Centre mondial d'information agricole
WAS	World Aquaculture Society
WinISIS	CDS/ISIS for Windows
WIO	Western Indian Ocean
WIOMSA	Western Indian Ocean Marine Science Association
WRI	Water Research Institute
XML	Extensible markup language

1. INFORMATION AND THE CODE OF CONDUCT FOR RESPONSIBLE FISHERIES

1.1 Introduction to the Code of Conduct for Responsible Fisheries

The *Code of Conduct for Responsible Fisheries*, formally adopted by the FAO Conference on 31 October 1995, sets forth a voluntary policy framework for sustainable and responsible fisheries and aquaculture worldwide (Doulman, 2004a, 2004b).

> **Fisheries, including aquaculture, provide a vital source of food, employment, recreation, trade and economic well being for people throughout the world, both for present and future generations and should therefore be conducted in a responsible manner. This Code sets out principles and international standards of behaviour for responsible practices with a view to ensuring the effective conservation, management and development of living aquatic resources, with due respect for the ecosystem and biodiversity. The Code recognises the nutritional, economic, social, environmental and cultural importance of fisheries, and the interests of all those concerned with the fishery sector. The Code takes into account the biological characteristics of the resources and their environment and the interests of consumers and other users. (FAO, 1995 p.1)**

Managing the world's fisheries for sustainability continues to be dynamic, difficult and multi-faceted. The same can be said of tracking implementation of the principles set forth in the Code. Progress on implementation of the Code is carefully monitored by the FAO Fisheries Department (Fisheries Department) which reports to the Committee on Fisheries (COFI). Biennial reports to COFI detail progress, constraints and priorities. COFI uses these reports to plan and direct the Fisheries Department's efforts towards the implementation of the Code. In the 2003 *Progress Report on Code Implementation*, FAO Members responding to the biennial questionnaire identified the following constraints when discussing fisheries research and data gathering (FAO, 2003a, Para. 50):

- insufficient human, financial and material resources to ensure basic and on-going research programmes;
- insufficient baseline studies and a general lack of information about species;
- lack of reliable information and data on indicators;
- lack of social and economic studies;
- lack of statistical coverage and difficulties in collecting data;
- inadequate training;
- insufficient information about fishing grounds.

More generally, Members reported the "poor levels of scientific research" and "weak institutional capacity (including poor national interagency coordination)" as two of many recurring constraints (FAO, 2003b, Para. 87). The 2001 Progress Report voiced related concern over the "lack of information and inadequate access to information" (FAO, 2001b, Para. 47).

Information is critical to successful implementation of responsible fisheries management at local, regional and global levels. It is acknowledged as the "key to sound policy-making" (FAO, 2003c). Two of the Code's 19 General Principles emphasize that decisions should be made based on "the best scientific evidence available" (FAO, 1995 Articles 6.4 and 6.5.) These same principles also mention the important role of various types of information including traditional and scientific.

The role of scientific information is generally recognized and can usually be described. Yet, supporting implementation of the Code requires a broad information base that includes social, economic, geographic and cultural perspectives as well as the purely scientific.

Within this context of the importance of information and the reported concerns from FAO Members about its availability, adequacy and accessibility, the Fisheries Department decided to examine these issues from the perspective of information users, creators and managers. Consequently, this Circular looks at the information needed to support implementation of the Code by:

- reviewing the types of information needed to support responsible fisheries;
- documenting the challenges, opportunities and constraints facing libraries, particularly those in developing countries, in providing that information;
- proposing strategies for improving access to information for those involved in fisheries management.

As a starting point, the requirements for and the role of information as discussed in the text of the Code is examined. Particular attention is paid to Article 12 which specifically addresses research and the need for data and information.

1.1.1 Article 12 of the Code of Conduct for Responsible Fisheries

Article 12 of the Code addresses Fisheries Research and sets forth challenges to fisheries researchers, managers and information professionals. In this introductory section, Article 12 offers insight on information collection, management and access. Key information issues emerge that could affect implementation of the Code.

> **12.1 States should recognize that responsible fisheries require the availability of a sound scientific basis to assist fisheries managers and other interested parties in making decisions. Therefore, States should ensure that appropriate research is conducted into all aspects of fisheries including biology, ecology, technology, environmental science, economics, social science, aquaculture and nutritional science.**

Issue: The availability of information
The "sound scientific basis" needs to be available and understandable to non-scientists. This implies synthesis as well as analysis, and communication in appropriate formats and language. Information is not available if it is not comprehensible by the intended audience.

Issue: The breadth of information
The breadth of information and data that is needed is wide, cutting across disciplines, ecosystems and political boundaries. The variety of subjects covered by fisheries poses significant challenges for those synthesizing available information, those reading it and those managing it.

> **12.3 States should ensure that data generated by research are analyzed, that the results of such analyses are published, respecting confidentiality where appropriate, and distributed in a timely and readily understood fashion, in order that the best scientific evidence is made available as a contribution to fisheries conservation, management and development. In the absence of adequate scientific information, appropriate research should be initiated as soon as possible.**

Issue: The relationship between data and information
Throughout Article 12, data collection is emphasized. Data are the raw material of research; information implies analysis and even synthesis. The section above alludes to the continuum between data and information. Fisheries management needs both, and consequently there needs to be awareness of the variety of types, formats and pieces of data and information that can potentially be valuable to management.

Issue: The distribution of information
Section 12.3 mentions appropriate distribution without specifying what this means. The format, content and language, i.e. the packaging of information, is determined by the intended audience and consequently, requires careful planning and implementation (Ikoja-Odongo and Ocholla, 2003).

Issue: The absence and inaccessibility of information
The absence of information can mean that it does not exist or that it is inaccessible. If the information is non-existent, then research is needed to fill the gap. If inaccessible, then necessary steps need to be taken to make it visible rather than recreating it through more research. This concept of absence or inaccessibility reinforces Section 12.1 and the concept of availability. Physical or language inaccessibility, lack of awareness or unanalysed data can all lead fisheries researchers and managers to assume that the information is absent.

> **12.4 States should collect reliable and accurate data which are required to assess the status of fisheries and ecosystems, including data on bycatch, discards and waste. Where appropriate, this data should be provided, at an appropriate time and level of aggregation, to relevant States and subregional, regional and global fisheries organizations.**

Issue: The sharing and exchanging of information
While collecting information is emphasized in the Code, just as important are sharing and exchanging data and information at various levels. Regional collaboration to share information is a strong strategy to fill gaps and enhance multi-level management. The *Strategy for improving information on status and trends of capture fisheries* seeks to address the issue via a partnership arrangement providing for international cooperation in the development of the Fisheries Resources Monitoring System (FIRMS). Communicating information appropriately is also a strategy often over-looked. For example, this could mean translating scientific language so that non-scientists can understand the information and use it to make informed decisions (Hanna *et al.*, 2000).

> **12.12 States should investigate and document traditional fisheries knowledge and technologies... in order to assess their application to sustainable fisheries conservation, management and development.**

Issue: Scale and source of information
Documenting, using and archiving traditional knowledge enriches the pool of available information (Campbell and Salagrama, 2001). Traditional knowledge is part of the continuum of information required for responsible fisheries management. This continuum can be described as data and information being transformed into knowledge and then knowledge evolving into wisdom (Eliot, 1934; Cleveland, 1982). Consequently, traditional knowledge becomes one source of information, usually of a local scale. The concepts of source and scale are applicable to other types of fisheries information such as grey literature and historic data. Traditional knowledge infers integration of social and cultural information, thus reinforcing the concept of the breadth of information needed for responsible fisheries management (FAO, 2000).

> **12.16 States should, where appropriate, support the establishment of mechanisms including, inter alia, the adoption of uniform guidelines, to facilitate research at the sub-regional or regional level and should encourage the sharing of the results of such research with other regions.**

Issue: The mechanisms to collect and share information
The sharing of information, mentioned earlier, merits reiteration here in terms of establishing ways to collect and manage information so that it can be shared. Uniform guidelines most directly apply to data collection. The concept when applied to information is also relevant (Faye and UNECA, 1995). For example, information collected on a local level may use terminology that prevents it from being

readily understood by others. Choice of words and their organization take on more importance when there is a possibility of dissemination beyond a limited audience.

> **12.18 States and relevant international organizations should promote and enhance the research capacities of developing countries, inter alia, in the areas of data collection and analysis, information, science and technology, human resource development and provision of research facilities, in order for them to participate effectively in the conservation, management and sustainable use of living aquatic resources.**

Issue: Integration of information into organizations
Enhancing access to information is critical to improving the research capacity of developing countries (Ballantyne, 1995; Ibeun, 2001). Access to fisheries information involves many elements, including real and virtual access to resources as well as the personal capacity to locate and use appropriate information. Effective participation implies adequate access to information and the ability to contribute to the process by providing information.

1.1.2 Research questions and methodology

The various issues raised in Article 12 relate to the ongoing constraints to Code implementation voiced by COFI. Table 1 compares the Article 12 issues with those constraints and illustrates the commonality among them. Addressing these recurrent issues with information is obviously critical to successful implementation of the Code. The challenge becomes how to do so. While this paper does not "solve" the information issues involved with responsible fisheries management, it attempts to promote a better understanding of those issues. So, rather than report that "there is a lack of information", we investigate what are the data and information needed and used for fisheries management so others can identify what is missing, what is inaccessible and what is simply not well integrated. Articulating the constraints and opportunities for access to information, especially in developing countries, helps give context to COFI's concern with "inadequate access to information". Libraries and documentation centres are one component of institutional capacity, playing a critical role in information at corporate level. As such, they provide a particular forum for proposing and discussing strategies for strengthening institutional capacity.

The following three questions derived from the above, guide our approach to addressing the issues identified in Article 12 of the Code and the constraints on fisheries research articulated by FAO Members. They provide a means to examine the information needed to support implementation of the Code and the role of libraries in this endeavour. Below is a brief explanation of each question in terms of the Article 12 issues followed by the particular tasks undertaken to answer each. Throughout, the relevant literature was reviewed including the topics of fisheries management, information for development, library science, use of grey literature, interdisciplinary research and fisheries in developing countries. Pertinent FAO documents such as recent COFI reports and several of the FAO Fisheries series were read. The Code and its implementation were discussed with staff in the FAO Fisheries Department and selected case studies and experts elsewhere.

a) **What are the data and information needed and used for fisheries science and perhaps more importantly, fisheries management?**

   The issues of the breadth, the absence of relevant information, the integration of information of varying scales and sources frame this question. Additionally, the relationship and the differences between data and information can be addressed.

   The core documents of the Code provide a base of information for this project. They are referred to throughout this report in terms of how they are disseminated and how they are used. The Fisheries Department staff and selected fisheries experts were surveyed on their use of Code-related information. This provided an important perspective on what information

fisheries policy-makers need and actually use. Citation studies were done on Code-related information produced by FAO, the academic community and selective governmental, non-governmental and international organizations. While not without their limitations, such studies examine what authors use when writing publications.

b) What data and information are available for decision making?

"What" in this context implies how information is made available, e.g. how it is shared and exchanged. The issues of the availability, accessibility and packaging of information are relevant. The question also touches on what information may be absent.

The Fisheries Department survey also looked at what Code-related information the staff members produce and disseminate as this should be part of the available information. We looked broadly at trends in the publishing of, the access to and the dissemination of fisheries information in some developing countries. Case studies were done to ascertain the availability of fisheries management information in four varied fisheries libraries/documentation centres.

c) What opportunities exist for fisheries libraries in all countries to address the constraints of lack of and inadequate access to information?

The final question focuses on the integration of information into organizations as well as the mechanisms needed to collect and share information. Libraries are focal points for the collection, management and dissemination of timely and relevant information in well-functioning research institutes. Burgess commented that "The library is one of the cheapest places to carry out research" (Burgess, 1974). Realization of the library as a critical part of the institutional structure requires resources. Libraries and their networks provide a cost-effective mechanism to facilitate information sharing (Ngwira, 2003; United Nations, Social and Economic Council, 2003).

The case studies also helped identify constraints and opportunities, as did the report of the November 2003 Regional Workshop on Networking for Improved Access to Fisheries and Aquaculture Information in Africa provided more insight (FAO, 2004f). Trends in information technology were monitored as were the emerging information access strategies of the International Association of Aquatic and Marine Science Libraries and Information Centres (IAMSLIC).

Table 1: Information constraints identified by COFI and information issues from Article 12 of the Code

General constraints	Research and data gathering constraints	Issues from Article 12 of the Code
Poor levels of scientific research	Insufficient baseline studies	Relationship between data and information
		Mechanisms to collect and share information
Lack of information	Lack of reliable information/data on indicators	Absence and inaccessibility of information
	Lack of social and economic studies	Breadth of information
	Lack of statistical coverage	Scale and source of information
	Insufficient information about fishing grounds	
Weak institutional capacity	Insufficient human, financial and material resources	Distribution of information
	Inadequate training	Integration of information in organizations
Inadequate access to information		Availability of information
		Sharing and exchange of information

1.2 The Code of Conduct for Responsible Fisheries core documents

1.2.1 Description of the Code core documents

The core documents of the Code of Conduct for Responsible Fisheries are the *Code* (1995), four International Plans of Action (1999 and 2001), the *Strategy for improving information on status and trends of capture fisheries (Strategy-STF)* (2003) and twelve Technical Guidelines (1996-2002) (Annex 1). Throughout this Circular, these documents are referred to as the "Code core documents". This core includes the Voluntary Instruments which have been agreed and adopted by Members (i.e. the Code, the Strategy-STF and the International Plans of Action) and key supporting documents produced by FAO (i.e. the Technical Guidelines.)

Other FAO Code-related publications exist, yet are less widely distributed, non-technical presentations of the Code or more recently published. The COFI meeting reports, project reports, and internal FAO documents pertaining to the creation of the Code and its subsequent implementation and evaluation are less widely distributed and not aimed at the broader fisheries management community. The pamphlet, "What is the Code of Conduct for Responsible Fisheries?" (FAO, 2001b) is an example of the approach the Fisheries Department is taking to reach a broader audience in a non-technical manner. The video, "Connecting the Lines", was produced in 2000 and is available in English, French and Spanish. Newer publications include the FishCode Review series, first published in 2003, that aims to facilitate Code implementation by communicating results of ongoing activities and projects.

1.2.2 Dissemination of Code documents

The Fisheries Department provides open access to the Code core documents. In addition to being available on the Department's website in full text, print copies are sold through the FAO Sales and Marketing Group, and are widely distributed to individuals and appropriate institutions and organizations by the Fisheries Department upon request and via established distribution lists. At the February 2003 COFI meeting, it was reported that "In the past two years, in excess of 13 000 copies of the Code and guidelines have been printed for distribution. The Code is now available in more than 60 languages. In addition, a CD-ROM containing all the Code of Conduct related documents has been prepared and distributed" (FAO, 2003b).

These production numbers are greater than those for the Department's flagship publication, the biennial *State of World Fisheries and Aquaculture* (*SOFIA*), reflecting the Department's commitment to dissemination of the *Code* (Table 2). Also, the Code has been translated into more languages than any other FAO document.

Table 2: Size of print runs for the *Code of Conduct* and *SOFIA*

	English	French	Spanish	Arabic	Chinese
Code of Conduct (1st print run)	10000	6000	6000	375	250
SOFIA (2000)	5800	2000	2000	700	200
SOFIA (2002)	4500	1000	1400	500	250

It is safe to assume that most copies of the Code and the guidelines are in the hands of individuals. A check of library holdings in the Online Computer Library Centre union catalogue indicates that the Code is held by 114 libraries reporting to this major database of North American institutions.[6] Further investigation reveals inconsistent holdings among more specialized fisheries libraries or research institutes.[7] Again, these holdings figures are similar to *SOFIA*. The liberal individual distribution should enhance the availability of the documents to the target audiences.

1.3 Code related information produced, disseminated and used by Fisheries Department Staff

In April 2004, the staff of the Fisheries Department was surveyed on their use and creation of information supporting implementation of the Code. In this section, the responses concerning the number of, the audience and the dissemination methods for publications produced by the Department are summarized. Responses on the searching for and the use of information are summarized in the next section 1.3.3. A more complete discussion of the survey and its results are provided in Annex 2.

1.3.1 Methodology

Seventy FAO staff members were sent a web-based survey containing 21 questions. Given those on duty travel and otherwise unavailable to participate, the survey sample was reduced to 59. A prompt was sent 10 days after the initial contact. Thirty four of the adjusted sample responded fully, i.e. a response rate of 57.6 percent. Responses were well distributed throughout the Department's four

[6] OCLC Online Computer Library Centre is a non-profit library service and research organization dedicated to the furthering access to the world's information and reducing information costs. More than 45,000 libraries in 84 countries and territories around the world use OCLC services to locate, acquire, catalogue, lend and preserve library materials. It is primarily north American but major European libraries collections are reflected as well. For more information, see the OCLC website at http://www.oclc.org.

[7] Brief surveys of the International Association of Aquatic and Marine Science Libraries and Information Centers union catalog and the European regional group of IAMSLIC indicated that many libraries had incomplete holdings of the Code documents. While many institutions represented by IAMSLIC are more marine science focused over fisheries/aquaculture, the Code itself would be appropriate in all library collections. Additionally, the database of the Institut de Recherche et Development was searched with no results.

divisions, namely Information, Data and Statistics; Policy and Planning; Industries; Resources and Environment, each of which is responsible for one work programme. Of those 34 responding, two indicated they did not work with the Code at all. Three only used Code information while two only produced it. Consequently, for most questions, the useful responses were 31 for the questions on using Code information and 30 for those on creating Code-related publications.

1.3.2 Summary of findings on production and dissemination of publications

Volume and subject areas covered by publications

Thirty of the respondents indicated that they produced publications related to the Code. Most produce ten or less publications annually. Print remains the format most used.

Subject areas addressed by the publications produced are varied, yet focus on the broad topics of "fisheries management" and "policy and planning". When compared with the subjects searched by these respondents, their publication subjects are more focused.

Audience and dissemination methods

In general, the audience of FAO Code publications is distributed broadly by sector and geography. Almost all identified developing countries as their primary audience. This breadth and focus could affect the format, dissemination method and content of the publications. While print is still the most used format, digital publication is also seen as important to the respondents reflecting both an awareness of the variability of access of their audience and the reality of the publishing environment within the Fisheries Department. Many of the respondents use multiple methods to disseminate their publications from the use of targeted mailing lists to the FAO web site to responding to requests. Few use the peer-reviewed literature for Code-related publications. As long as the targeted mailing list and the FAO website remain highly functional, the intended audience should be well-served. Respondents indicate that their audiences find out about their publications by searching the FAO web site or through contact at meeting, workshops and conferences. This is potentially problematic for those sectors of the audience without Internet access or funds to attend meetings. Greater use of the *Aquatic Sciences and Fisheries Abstracts* (ASFA) may be useful for broader dissemination.

Archiving of publications

The Fisheries Department is "mandated to compile, analyse and disseminate fishery data and information" (FAO, 2004a). While not explicitly mentioned in the Department's mandate, FAO does have a policy and a process for archiving FAO publications, and the institutional memory of FAO is the responsibility of the General Affairs and Information Department. There was general recognition of the need for archiving both print and electronic publications. Various methods were described with no strong consensus on the most appropriate or sustainable.

1.3.3 Subject information used by FAO Fisheries Department staff

Identifying the material that Fisheries Department staff members use to produce Code publications helps to understand the information potentially needed by others. This part summarizes the section of the Fisheries Department survey which addresses how the staff members search for information. Detailed discussion of the survey results are covered in Annex 2. Participants were asked about patterns of usage, tools and resources used as well as specific tasks done. Respondents also identified subject areas of primary interest.

Summary of findings

Time spent and subjects searched

More than half of the respondents regularly search for Code-related information while less than a quarter seldom look for Code-related information. The subject areas are listed by frequency of use in Table 3. "Fisheries Management" along with "Policy and Planning" have the highest ranking. In general, those at FAO actively involved with the implementation of the Code look for various types of information across a broad range of subject areas.

The staff members were asked to give examples of search terms they use for Code-related information as well as specific tasks they had recently executed. The responses give insight into the subject areas people are working on and how they go about doing the information gathering component of their work. The tasks fall into four categories:

- **Searching for specific publications:**
  Many of the specific publications mentioned are FAO publications, which are electronically available through the Fisheries Department web page or another FAO source.

- **Searching for statistics:**
  Many respondents look for statistics, and most of those use the FAO Fisheries FISHSTAT resource.

- **Searching for information on specific subjects or concepts:**
  The variety of subjects and concepts illustrates the breadth of information needed to effectively work with the Code and implementation of responsible fisheries and aquaculture management. Many of the concepts need a complex search strategy over multiple resources to be successful.

- **Reviewing, discussing and working with information:**
  Reading, reviewing and discussing are important steps in synthesizing information into publications.

The search terms and phrases used cluster under three main subject areas: policy and planning, fisheries management, and economics and marketing. Again, the breadth of terms used is wide. There is a range of specificity as well. Missing from both the task list and the search terms are scientific items. Some general terms such as ecosystem and genetics appear. However, given the context of the survey, these appear to be used in conjunction with management concepts such as mixed-stocks or introduced species. This observation reinforces the point that when looking for Code-related information, respondents focus on management and policy concepts with some overlap into pure science.

Information retrieval tools used

Relatively few tools appear to be widely and regularly used. The Internet with a search engine has the widest regular use with almost 61 percent of respondents using it at least weekly to locate Code-related information. This pattern of use is reinforced by the 46 percent who indicate using the FAO Web site regularly. More surprising is the 39 percent of respondents who never or seldom use the Internet for Code-related information. The non-use of either suggests that some respondents do not use the Internet regularly, or do not use it for Code-related information.

Thirty-nine per cent of respondents use the FAO Fisheries Library on a weekly basis. ASFA is the only subject specific bibliographic tool to be used by a core group of respondents (23 percent) on a regular basis. The *Aquatic Biology, Aquaculture and Fisheries Resources* (ABAFR) database is also

available, but staff is less familiar with it. ASFA is a familiar tool to many and the ASFA Secretariat is housed in the Fisheries Department.

Code-related information that is difficult to find

Eleven respondents specified difficult or impossible to find information. There was a range of frustration level with some saying "no problems" while others thought that "much" was hard to find. Looking at specific problems, the information needed is difficult to locate usually because it is scattered, supplied by agencies or institutions unfamiliar to the user, not well-synthesized or not adequately compiled. While the frustration is moderate, the FAO Fisheries Department may be able to alleviate some of it by addressing specific information needs. Better tracking and compilation of individual country Code activity would be beneficial to the Department as well as outsiders.

1.3.4 Subject information used and produced by selected fisheries experts

A small group of fisheries experts outside of FAO were surveyed to provide validation of results from the FAO Fisheries Department staff survey. They were selected on the basis of their geographic location, their institutional base and their level of involvement with fisheries science and management. All are familiar with the Code. Detailed discussion of the survey results are covered in Annex 3.

Their searching behaviour was similar to that of FAO Fisheries Department staff with the majority searching for information on a weekly basis. The subject areas searched include policy and planning, law and legislation, and economics, marketing and trade. Fisheries science was not a term used in management or policy work by the respondents. The search terms used were also very similar to those of the Fisheries Department as was the usage of retrieval tools. The only real difference is that the experts appear to rely on their institutional libraries slightly more.

Examples of hard to find information were similar to those identified by the Fisheries Department. One area of agreement was information on individual country implementation of international agreements as well as infringements on agreements. The other area dealt with statistics.

The experts were asked about their reading and information use patterns, questions not asked of the FAO Fisheries Department. Their responses show a reliance on local or subject specific information and regular use of a wide variety of grey literature. These findings are consistent with the later citation studies, the survey and interviews with FAO staff. The experts also reported using grey literature from a variety of sources regularly or occasionally.

Table 3: Subject areas searched by survey respondents when doing Code-related work

	FAO Fisheries Division					Totals	
Subject Areas	Information, Data and Statistics	Industries	Policy and Planning	Resources and Environment	Other FAO Dept.	**Total Responses**	Number of Units Responding
Fisheries management	3	3	8	6	1	**21**	5
Policy and planning	3	1	10	4	1	**19**	5
Ecosystem approach to fisheries	4	1	5	5	1	**16**	5
Aquaculture (includes fish, shellfish, and aquatic plants)	2	1	7	4	1	**15**	5
Law and legislation	3	2	8	1	1	**15**	5
Economics and marketing	3	3	8			**14**	3
Integrated coastal area management	1	2	7	2	1	**13**	5
Effects of aquaculture on the environment	2	1	5	2		**10**	4
Social and anthropological aspects of fisheries	1	1	6	2		**10**	4
Information access and dissemination	4		3	1	1	**9**	4
Fishing gear and methods	1	2	1	2	1	**7**	5
Fishery statistics and sampling	2	1	1	3		**7**	3
Food quality	2	2	1		1	**6**	4
Stock assessment			1	5		**6**	2
Aquatic products	2	1	1		1	**5**	4
Commodity and trade statistics	1	1	3			**5**	3
Fisheries biology and habitat		1		2		**3**	2
Fisheries nomenclature	1	1			1	**3**	3
Food technology	2		1			**3**	2
Fishery oceanography and limnology				2		**2**	1
Genetics				2		**2**	1
Fishery charts and and mapping	1					**1**	1

1.4 What information is used to produce publications relevant to the Code of Conduct for Responsible Fisheries?

1.4.1 Background

It is not easy to assess what information is needed to support implementation of the Code and responsible fisheries management in general. Investigating what different audiences use to produce relevant publications is one strategy. Typically, this is done through citation studies that show what is cited within a publication as well as what cites that publication. The Institute of Scientific Information's *Web of Science,* the major tool for doing traditional citation analysis, does not work well with fisheries policy and management documents for two primary reasons. First, policy guidelines, management plans and industry sector strategies are often drafted in formats that preclude formal references or citations. For example, both the United States and the Canadian implementation plans of the Code acknowledge the FAO Code, but do not include formal references (United States National Marine Fisheries Service, 1997; Canadian Department of Fisheries and Oceans, 1998). Second, those publications that might have citations are often not covered by the *Web of Science*. These include many journals published elsewhere than North America and Europe, more popular fisheries publications and grey literature.[8] This makes it more challenging to monitor how well the Code core documents are being used. Others have articulated similar frustration with tracking information usage of grey literature and information used to create grey literature (Rama and Takalkar, 2000).

Consequently, several approaches were used to investigate what types of information are used to produce the Code core documents and other responsible fisheries publications. The *Web of Science* from 1995 to the present was searched both by cited reference and general keyword for mention of the Code core documents. We examined the Code core documents as well as the FishCode Review series to discover what information resources were used in their creation. Selected national documents pertaining to the Code were examined for citations of the Code and the Technical Guidelines as well as to identify general types of information used to produce them. Selected publications of intergovernmental and regional organizations provided insight into the types of information used by those with varying levels of access to information. Finally, the articles or chapters in three recent edited compilations were reviewed for references.

The summary of findings has been organized by the sector producing the publications. Detailed analyses and discussion are provided in Annex 4. These divisions are not precise as there is overlap between audience and producers. However, it helps sort out the information landscape of fisheries policy and management if we keep in mind the perspective of the producers and the readers. It also reinforces the challenge of assessing the types of information needed.

1.4.2 Information produced by the academic and research community

Web of Science citation analysis: Citations to the Code core documents

Various citation searches of the *Web of Science* from 1995 to spring 2004 revealed 107 documents that cited 11 Code documents with 126 citations to those documents. These numbers indicate good usage of the Code core documents compared to a similar study of GESAMP publications (Cordes, 2002) that found 114 GESAMP publications cited in 1178 papers with 1436 citations. The citation rate also compares well with *SOFIA,* a publication that perhaps has more visibility in the academic and research

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[8] Grey literature usually refers to the publications produced by all levels of governments, organizations, academics, business and industry in print and digital formats, but whose publication and dissemination are not controlled by commercial publishers, and where publishing is not the primary business activity of the entity (The Third International Conference on Grey Literature 1998; Gelfand, 2000). Examples include technical reports, official documents, and industry guidelines. Many conference proceedings are also grey, especially those that are unedited or published by a non-commercial organization

community.[9] The *Code* itself is the most heavily cited followed by *Technical Guideline 2* on the precautionary approach to capture fisheries.

***Web of Science* citation analysis: Types of journals citing the Code core documents**

The journals containing articles that cite the Code core documents were compared to several compiled lists to better understand the subject coverage. More detailed discussion of the list compilation is in Annex 4. The Code core documents have been cited in a range of journals and, as expected, most articles appear in titles with a management focus or element (Table 4). Ten of the management journals have articles citing the Code while only six of the ISI science journals have such articles. If the number of articles citing the Code is considered, far more appear in management journals (51 compared to 33 in science journals). These observations suggest that the Code core documents are being discussed and integrated into the mainstream of fisheries and aquaculture management journals. Their presence among fisheries scientists is perhaps less established. This may be important to implementation of the Code of Conduct; a broad understanding of responsible fisheries is needed by both scientists and managers.

Comparing the lists in Table 4 vividly illustrates the challenges in providing information to support Code implementation. To some, the split between science and management journals may seem arbitrary as many journals espouse to cover both. In reality, a journal's focus tends towards one with occasional forays into the other. List 2, the top ISI ranked science titles, and List 4, a more eclectic list of management titles, only share five titles. This apparent split between science and management challenges libraries in their collection development. It also challenges scientists and fisheries managers wanting to promote responsible fisheries concepts in the peer-reviewed literature. The lists also illustrate the problem of addressing the increased amount of fisheries-related information. The challenge for libraries is in providing access comprehensively or even effectively given stagnant or in many developing countries non-existent budgets. The challenge for scientists and managers is identifying appropriate outlets for publishing as well as which journals to track for information. As an example of the challenge faced in developing countries, List 3 suggests that African scientists have not had consistent access to the major fisheries-related titles as that list shares only four science title and three management titles. The choice of journals for both publication and consultation is not always clear, and access to them not always easy for the potential reader.

[9] A cited reference search for *SOFIA* in the *Web of Science* is somewhat problematic as the title can be abbreviated in several ways and easily confused with other FAO statistical publications. Also, the year of publication is inconsistently cited by authors who often confuse the data in the title with the actual data of publication. Given these constraints, 107 citation were identified to the 1996, 1998 and 2000 editions of SOFIA (publication dates of 1997, 1999, and 2001.)

Table 4: Fisheries & aquaculture journals: comparison of journals citing Code documents with journals used in fisheries science

List 1: 22 Journals citing the Code core documents (# articles)	**List 2:** Top 15 fisheries journals by 2003 ISI Impact Factor	**List 3:** 21 Fisheries journals used by African scientists	**List 4:** 15 Fisheries/aquaculture management journals
		African J. of Ecology	
African J. of Marine Sci.[10] (3)			
Aquaculture (4)	Aquaculture	Aquaculture	
			Aquaculture Econ. & Management
		Aquaculture Research[11]	
	Aquaculture Nutrition		
Aquaculture International (2)			
Aquatic Conservation (2)			
Aquatic Living Resources (2)			
		Archiv Hydrobiologia	
		Asian Fisheries Society	
Bulletin of Marine Science (2)			Bulletin of Marine Science
Can. J of Fish. & Aquatic Sci. (5)	Can. J. of Fish. & Aquatic Sci.	Can. J of Fish. & Aquatic Sci.	Can. J of Fish. & Aquatic Sci.
			Coastal Management
	Diseases of Aquatic Organisms		
Ecological Applications (3)			
	Ecology of Freshwater Fishes		
		Environmental Biology of Fishes	
	Fish & Shellfish Immunology		
		Fish Physiology & Biochemistry	
Fisheries Management & Ecol.[12] (4)		Fisheries Management & Ecol.	Fisheries Management & Ecol.
	Fisheries (AFS)		

[10] Formerly *South African Journal of Marine Science.*

[11] Formerly part of *Aquaculture & Fisheries Management.*

[12] Formerly part of *Aquaculture & Fisheries Management.*

List 1: 22 Journals citing the Code core documents (# articles)	**List 2:** Top 15 fisheries journals by 2003 ISI Impact Factor	**List 3:** 21 Fisheries journals used by African scientists	**List 4:** 15 Fisheries/aquaculture management journals
	Fisheries Oceanography		
Fisheries Research (17)	Fisheries Research		Fisheries Research
Fishery Bulletin (4)			Fishery Bulletin
		Fishery Technology	
		Freshwater Biology	
Hydrobiologia (2)		Hydrobiologia	
ICES J. of Marine Sci. (2)	ICES J. of Marine Sci.		ICES J. of Marine Sci.
			Intl. J. of Marine & Coastal Law
		Israeli J. of Aquaculture-Bamidegh	
J. of Applied Ichthyology (2)			
		J. of Aquaculture in the Tropics	
		J. of Aquatic Plant Management	
	J. of Fish Biology	J. of Fish Biology	
	J. of Fish Diseases	J. of Fish Diseases	
		J. of Ichthyology	
		Limnology & Oceanography	
Marine & Freshwater Research (2)	Marine & Freshwater Research		
Marine Policy (3)			Marine Policy
		NAGA, WorldFish Quarterly	NAGA, WorldFish Quarterly
Nippon Suisan Gakkaishi (2)			
		North American J of Aquaculture[13]	
Ocean & Coastal Management (9)			Ocean & Coastal Management
Ocean Development & Intl. Law (2)			Ocean Development & Intl. Law
Rev. in Fish Biology & Fisheries (3)	Rev. in Fish Biology & Fisheries		Rev. in Fish Biology & Fisheries

[13] Formerly *Progressive Fish Culturist*.

List 1: 22 Journals citing the Code core documents (# articles)	**List 2:** Top 15 fisheries journals by 2003 ISI Impact Factor	**List 3:** 21 Fisheries journals used by African scientists	**List 4:** 15 Fisheries/aquaculture management journals
Scientia Marina (3)			
South African J. of Marine Sci.[14] (3)			
	Trans. of the American Fish. Soc.		Trans. of the American Fish. Soc.

[14] Now *African Journal of Marine Science.*

1.4.3 Three recent international compilations on responsible fisheries issues

Methodology

These three publications address responsible fisheries in various contexts and by a variety of contributors. They involve authors and an audience that crosses between the academic and the policy communities. FAO staff contributed to the content and editing of two of the volumes. The three compilations are as follows:

> *Responsible Marine Aquaculture*. 2002. Stickney, R.R. and McVey, J.P. (editors.) CAB International.
>
> *Responsible Fisheries in the Marine Ecosystem*. 2003. Sinclair, M. and Valdimarsson, G. (editors.) FAO Fishery Industries Division and CABI Publishing
>
> *Current Fisheries Issues and the Food and Agriculture Organization of the United Nations*. Nordquist, M.H. and Moore, J.N. (editors.) 2000. Kluwer Law International

Use of the Code core documents

Formal citing of the Code core documents is not as extensive as expected in the first two publications and is higher than anticipated in the *Current Fishery Issues*. In general, the lack of references to the Code provides sparse evidence of active use and promotion of the Code and its supporting documents

Use of other information

The three publications have different patterns of information usage reflecting both their respective subject areas and the intellectual culture of the authors. The differences are in relative usage of different categories of information and in amount of information cited. A quarter of the authors in *Current Fishery Issues* do not cite information used while the majority of authors in the two responsible publications do. These two also have significantly higher numbers of citations per article than the *Current Fishery Issues*. The pattern illustrates the culture of citation in the more scientific approach found in *Responsible Fisheries* and *Responsible Aquaculture*.

This same culture is reflected in the high use of peer-reviewed articles in both *Responsible Fisheries* and *Responsible Aquaculture*. Authors in *Current Fishery Issues* are more likely to cite grey literature (27 percent), FAO publications (20 percent including the Code core documents), laws (16 percent) and conference proceedings (20 percent) than the peer-reviewed literature (11 percent). This contrast is striking and could be an indicator of the importance of grey literature to these management and policy authors. However, there are differences in the two more scientific publications. The aquaculture authors cite the grey literature including conference proceedings far more than the fisheries authors. On the other hand, fisheries scientists and managers are more likely to find information needed in the peer-reviewed literature.

1.4.4 Information produced by governmental and non-governmental organizations

Methodology

The documents produced by various governmental and non-governmental organizations that address the Code are elusive. Most FAO Members that responded to the Fisheries Department's 2002 questionnaire on Code implementation favourably indicated that they conform to the *Code of Conduct* (FAO, 2003b para.21*)*. The Members also reported that 472 marine fishery management plans and 228 inland fishery management plans have been developed though implementation lags significantly behind development (Ibid. para.22). However, few of these plans are readily available electronically or

in print. Consequently, the small sample of available documents analysed does not reflect an exhaustive search and is limited to those documents published in English.

Use of the Code core documents

Most of the documents mention the *Code* whether in formal citations or in the document text. The authors of these pieces are aware of the Code given the subjects of their work and, it is a positive sign that they actively refer to it. This promotes the Code to those who read these documents.

Use of other types of information

As a group, these documents are most likely to cite peer-reviewed literature (31 percent), the grey literature of the publishing body (22 percent) and other grey literature (17 percent). This pattern changes somewhat within each group. There remains a heavy reliance on peer-reviewed literature in addition to a variety of grey literature.

1.4.5 Information produced by selected organizations with a regional or international focus

Methodology

Publications of several international and intergovernmental organizations were reviewed. The organizations reviewed were the WorldFish Center, Southeast Asian Fisheries Development Centre (SEAFDEC), Network of Aquaculture Centres in Asia-Pacific (NACA) and International Collective in Support of Fishworkers (ICSF.) Few are publishing documents specifically addressing the Code, yet all do produce publications on responsible fisheries and aquaculture. It was felt that the use of information by these authors would give additional perspective on the organizations themselves and their constituencies

Use of the Code core documents

In general, the Code core documents are poorly referenced. WorldFish Center documents do not reference the Code itself, but do refer specifically to the aquaculture related Technical Guidelines. SEAFDEC proceedings and reports rarely cite the Code. NACA publications mention the Code documents more than SEAFDEC. ICSF makes the most frequent mention of the Code in its journal, *Samudra*, and also discusses the IPOAs there. All in all, outside of news articles about the Code, there is little active integration of the Code into the publications of these organizations.

Use of other types of information

Comparing the use of grey literature versus peer-reviewed literature among the four organizations reveals differences in usage. The total for all four organizations shows 44 percent of citations are to grey literature versus 31 percent to peer-reviewed articles. However, WorldFish and NACA have similar ratios to each other and show a higher reliance on the peer-reviewed literature. This reflects the nature of their publications as more scientific than those of ICSF and SEAFDEC. These two organizations rely far more on grey literature. Over half of ICSF's citations are to grey literature while SEAFDEC's reliance is even higher. This reiterates the importance of local and regional information. It also suggests that there is great variety in what information is accessible in different parts of the world and in different communities of users.

1.4.6 Information types used in the Code core documents

Methodology

The final community of users is the FAO Fisheries Department and those who produce the Core publications. The publications examined have been described earlier in Part 1.2.1 as the Code core

documents. These documents do not consistently or formally cite publications used by their authors and the formats and writing styles clearly show different approaches by the authors. The addition of references as a bibliography, footnotes or endnotes would be helpful to a reader interested in knowing more about the subject and the authority of the document's content. Those that include citations or references are five of the twelve Technical Guidelines, three of the four FishCode Reviews and the 1999 IPOAs. These publications were examined to see how the Code core documents were referenced, and then to identify the types of other information used

Use of Code core documents

Currently, the Code core documents are not consistently reiterated throughout all Code documents. While most have a background piece or foreword detailing the history of the Code, few make it an active part of the document. This is partly stylistic as the technical guidelines are written by different authors and for various audiences.

Use of other types of information

All the Code core documents with citations use FAO Fisheries publications and 9 of the 11 use grey literature. There are neither obvious patterns of usage nor consistent items cited by all. Information usage is specific to the topic of each guideline. These documents make extensive use of other FAO publications especially those of the Fisheries Department. In fact, over a third of the citations are to FAO publications. This is not unexpected as these are the working documents of the Department, the publications of greatest familiarity and accessibility.

Authors of the Code documents rely heavily on the grey literature, material that is usually less widely distributed, not subject to formal review, and not well preserved. References to conference proceedings and other grey literature account for 32 percent. The peer-reviewed articles account for 21 percent of the citations, and are cited in six of the eleven documents.

1.5 General discussion on the information for responsible fisheries management

The issues identified in Article 12 of the Code and the ongoing constraints to Code implementation voiced by COFI (Table 1) raise the challenges inherent in collecting and managing fisheries information. Without that information, responsible fisheries policy has no foundation. The challenges, constraints or opportunities, depending on your perspective, fall under two primary activities: gathering the complex information itself and then providing access to that information.

To do either of these activities, libraries need to know what could or perhaps should be in their collections or accessible through cooperative agreements. The following summarizes the findings from the surveys and citation studies describing the nature of Code related information. It also provides a framework for bringing in observations from the relevant literature and relating other articles of the Code to the information issue.

Four major features of responsible fisheries information emerged from our studies of users and publications.

- Code information is broad and multidisciplinary.
- it has depth in terms of time and perspective.
- it involves various scales from very local to global.
- it comes from a complex mix of sources.

Each of these features has a significant impact on how libraries collect, manage and disseminate the information.

Breadth

Perhaps the most obvious feature of responsible fisheries information is its breadth, meaning the variety of disciplines involved, the wealth of languages and the range of voices. This is clearly articulated in Article 12 of the Code and repeated in Article 6 on General Principles.

> *6.4 Conservation and management decisions for fisheries should be based on the best scientific evidence available, also taking into account traditional knowledge of the resources and their habitat, as well as relevant environmental, economic and social factors.* (FAO, 1995 p. 5)

> *12.1 ...States should ensure that appropriate research is conducted into all aspects of fisheries including biology, ecology, technology, environmental science, economics, social science, aquaculture and nutritional science.* (FAO, 1995 p. 32)

The variety of disciplines involved also emerges from the survey data of FAO Fisheries Department staff. When asked about subjects searched and information tasks completed, the breadth is demonstrated. The staff members search across policy, ecosystem approach, fisheries management, aquaculture, economics and law for relevant information. They look for information on capacity, food security, trade, artisanal fisheries, fishing gear and legal frameworks.

The information sources used by those actively involved in fisheries management come from a variety of producers. These include, but are not limited to, the traditional commercial publishers, non-governmental organizations and governments at various levels, professional societies, the industry and inter-governmental bodies. This breadth of publishers reinforces the diversity of information used and needed. It also poses a challenge for fisheries libraries that must develop mechanisms to track production of publications and then collect or provide access to the relevant ones. Additionally, the various producers of relevant information are located throughout the world. Some will be local, e.g. within a library's or institution's geographic scope, while others with potentially useful publications may be in distant countries with obscure or just different distribution methods.

The Code also reveals the breadth of information needed. Within fisheries per se, there are publications addressing marine fisheries, inland fisheries as well as aquaculture in several environments. Additionally, information produced by economists, demographers, historians is relevant. Monitoring the publications of these sectors as well as others is required to provide the breadth of information. Use of information from other disciplines can lead to both analysis and synthesis resulting in more valuable information (Palmer, 1999; Steele and Stier, 2000).

Depth

Developing and implementing environmental management takes time. The process, at its best, is recursive meaning decisions are made and implemented, results evaluated, and changes made in both policy and its implementation. Information to support this process should reflect it; the pool of available information should be deeper than the most recent or the most accessible. Throughout Article 12, allusions are made to activities that require time-series and historic information. Examples include "an appropriate time and level" (12.4) "ongoing monitoring, analysis and policy formulation" (12.9) and "assess...the impacts of ecosystem changes" (12.5). Other articles of the Code also refer to the ongoing generation, management and use of information:

> *7.6.8 The efficacy of conservation management measures and their possible interactions should be kept under continuous review. Such measures should, as appropriate, be revised or abolished in light of new information.* (FAO, 1995 p. 14)

> *9.1.3 States should produce and regularly update aquaculture development strategies and plans.* (FAO, 1995 p. 23)

Two examples demonstrate the need for depth in collections and information resources. The first is simply the high use of fisheries statistics by the FAO Fisheries Department staff. Statistics typically are valued for their reliability as well as their longevity; people use them to document trends over time and region, hence the need for depth. The citation studies also found that *SOFIA* is highly cited throughout the literature by all types of users. This reinforces the evidence of heavy use of trend and statistical information.

The second example is localized and shows the use of information by publication date. The 490 citations in 29 papers published in the 2001 *Proceedings of the Lake Malawi Fisheries Management Symposium* were analysed for various traits, one of which was publication date (Weyl and Weyl, 2001). The results showed that while almost 70 per cent of the citations were to literature published since 1990, over 30 per cent were to older literature (Table 5). This trend was particularly significant in papers addressing species distribution and taxonomy.

Table 5: Publication Dates of Citations in *Proceedings of the Lake Malawi Fisheries Management Symposium*

Date range	% of citations
Pre 1960	3
1960s	1
1970s	10
1980s	17
1990-1994	19
1995-1999	33
2000s	16

Older information is valuable and in fact, is often essential to effective fisheries management. Too often, historic information is lost due to lack of its management or neglect. Fisheries libraries can play an important role in capturing and archiving the historic record so that future fisheries scientists and managers will have greater context for their work (Smith 1994).

Scale

Fisheries management begins locally as this is where livelihoods are created and sustained. This is the scale where conversations take place, decisions are made, and plans implemented. The information of various scales is needed and used at the local level. The Code also emphasizes the need to create and share information across political boundaries as fisheries resources are usually shared across space and time. This emphasis assumes local information gathering.

> *6.4 In recognizing the transboundary nature of many aquatic ecosystems, States should encourage bilateral and multilateral cooperation in research, as appropriate.*
>
> *10.3.1 States with neighbouring coastal areas should cooperate with one another to facilitate the sustainable use of coastal resources and the conservation of the environment.*

The citation studies of various communities showed that all use information of various scales, from local to global, and from a variety of producers, from local institutions to international publishers (Tables 4.3, 4.5 and 4.6). Harder to display is the provincialism of fisheries information and its usage. This should not be seen as a criticism, merely a characteristic. People use and cite what is relevant and accessible. Often, this is local information produced by the home institution of the author. Often it is discipline specific and therefore intellectually accessible through the author's training and professional contacts.

Libraries play a critical role in collecting local information. Often the local library or institution has the best and perhaps only opportunity to identify and obtain copies of locally produced publications. For example, Kadzamira, Ngwira and Salanje observed that over 80 per cent of the publications included in the aquaculture database developed at Bunda College Library in Malawi were not covered in the international database, *Aquatic Biology, Aquaculture and Fisheries Resources* (Kadzamira, Ngwira and Salanje, 2004). This gap in coverage suggests that the local library also has a role in providing access beyond its physical walls. Recognition of and compatibility with national, regional and even international information systems are essential to successfully share collections and information across boundaries. This is particularly true where human and financial resources are limited. Article 9.2.4 states this using the adjective "appropriate" as it outlines collaborative efforts in aquaculture. Yet, local fisheries information is often not "standard", so the library sometimes must make it more usable (i.e. binding loose material or copying fragile items).

> *9.2.4 States should establish appropriate mechanisms such as databases and information networks to collect, share and disseminate data related to their aquaculture activities to facilitate cooperation on planning for aquaculture development at the global level.*

Even if the management of local fisheries information is problematic, its utility in fisheries management is important. "Local knowledge can be used to corroborate science data and to fill in gaps in the scientifically generated data. While local knowledge typically is not subject to the same peer review as scientific knowledge, triangulation with other data sources and comparative techniques can help validate it" (Scholz *et al.* 2004). The library is hence charged with facilitating linkages among the local information throughout the region as well as to the scientific and other relevant information. Payne summarizes this well, "The capacity for access to information that is relevant and in the appropriate format needs to be increased at regional, national, and in particular, at community levels" (Payne, 2000). This is no small task.

Source

The variety of sources of fisheries information adds complexity and perhaps volatility to the nature of the information. Fisheries management is an interaction among science, economics, politics, technology, ecosystems, history, the people involved and the fish (Hanna *et al.*, 2000). The information produced and used in fisheries policy work reflects the differences between science and policy. Orbach articulates this well when describing the interaction between science and policy in coastal zone management: "...science is concerned with description and explanation, while policy is concerned with governance of human behaviour....Science and policy-making are different from one another, but complementary" (Orbach, 1996). The Code supports the contribution of science to the management process just as it validates using information on all aspects of fisheries from biology to nutrition.

> *12.1 States should recognize that responsible fisheries requires the availability of a sound science basis to assist fisheries managers and other interested parties in making decisions. Therefore, State should ensure that appropriate research is conducted into all aspects of fisheries including biology, ecology, technology, environmental science, economics, social science, aquaculture and nutritional science.*
>
> *12.3 ...the best scientific information is made available as a contribution to fisheries conservation, management and development.*

The local population often has a deep knowledge of their physical, cultural and economic community that can help inform the management process (Ulluwishewa, 1993; FAO, 2001a). The fishing industry can contribute information, yet questions about validity, relevance and bias are often raised (Hanna *et al.*, 2000; Harms and Sylvia 2001). Weeks suggests that separating the "purely scientifically based knowledge from a more practically gained local knowledge" is especially difficult in information rich

societies (p. 435, 1995). The Code emphasizes the importance of different sources of information including traditional knowledge.

> *6.4 Conservation and management decisions for fisheries should be based on the best scientific evidence available, also taking into account traditional knowledge of the resources and their habitat, as well as relevant environmental, economic and social factors.*

The various stakeholders bring different perspectives to fisheries management, often leading to a highly charged process. Fisheries information reflects the same complexity and propensity for tension; different sources and disciplines produce publications adhering to guidelines and standards that contradict each other at times. For instance, the differences between commercially published journals and those produced locally by an institution in a developing country can be substantial. However, which is the more valid as useful information for local management decisions? Science often relies on the peer-review process to validate the information. Management and policy work draws information from a wider variety of sources, including outside the peer-reviewed sphere.

The value of grey literature, those publications outside of the readily available commercial publishing realm, is heightened in fisheries management as relevant information is not just the peer-reviewed or commercially produced. Much grey information is never published in the commercial realm; and if it does appear, the timeliness is problematic for decision making. Recognizing its value to and using it in fisheries management are critical.

Conclusion

Overall, the essential role of access to information is not apparent in the Code. Rather, data collection and information creation are emphasized. The discussion above suggests that access to and dissemination of information is as important as its creation. If policy-makers need and even expect "objective, reliable, credible and clear" information (O'Boyle, Rice and Sinclair, 1999) and stakeholders want their voices heard, the providers of information that is used in the management process face a massive challenge.

Encouraging people to recognize and use the information from different disciplines and different sources is vital. As Finlayson observes, "…fisheries management is fundamentally a social process" (Finlayson, 1994. p.154). Campbell and Salagrama refer to the different "knowledge systems" and the need for awareness of those by all involved in fisheries (Campbell and Salagrama, 2001). They continue by saying that collaborative fisheries management needs "to adopt more interdisciplinary and multidisciplinary approaches to research, develop interagency linkages and adopt new ways of combining social and natural research systems. It will also require changes in the way policy and research work together" (Ibid, p.viii). This final observation suggests that there are differences in the information used and produced by the different participants in responsible fisheries.

Fisheries libraries must find ways to provide access to the broad, deep and different sources of fisheries information. Libraries have a responsibility at the institutional level to act as focal points for the collection, management and dissemination of timely and relevant information. Institutions have a responsibility to provide the resources and support their libraries in this effort. An initial step is sharing an understanding of what information is needed to support implementation of the Code. Once that step is taken, fisheries libraries can secure the information needed, and assist the fisheries community in using it.

2. FISHERIES INFORMATION IN DEVELOPING COUNTRIES

Introduction

As was seen in Part 1, the information relevant to fisheries management in general and in support of implementation of the Code of Conduct in particular, is complex. The subject area:

- is broad and multidisciplinary;
- has depth in terms of time and perspective;
- encompasses various scales from local to global and;
- originates in a complex mix of sources.

In order to improve the dissemination and accessibility of relevant information in developing countries we need a better understanding of what is already available or accessible and the mechanisms which can be used to fill the information gaps in a sustainable and cost-effective way.

This overview of the current situation of fisheries information in developing countries is indicative rather than exhaustive and more information has been gathered in some regions than in others, paying particular attention to Low Income Food Deficit Countries (LIFDC) (FAO, 2004d), where several of the FAO Fisheries Department information activities concentrate their efforts. Examples of these activities are the projects of the Fisheries Information, Data and Statistics (FIDI) unit to make available the ASFA database and to work with a network of fisheries libraries to improve access to the full text documents.

The information covered in this section refers to fisheries and aquaculture in the broadest sense. The focus on information for fisheries management and in support of implementation of the Code is developing in response to the work programmes of the FAO Fisheries Department and the need to improve access to and dissemination of relevant information, in particular in developing countries. Relevant research is not limited to scientific and academic research but includes the broad subject base related to fisheries as well as the research and development work carried out by many different types of fisheries organization.

Part 2.1 gives a selected overview of the creation and publication of information on fisheries and aquaculture in developing countries, mainly to give an indication of the scope and the variety of publishing practices and to highlight the complexities of organizing and managing easy and cost-effective access to this information for all stakeholders. Part 2.2 covers the issues of dissemination and access to the published information produced in developing countries, as well as the mechanisms employed. Part 2.3 covers access to the large body of fisheries information from developed countries, much of which is commercially published. This presents a different set of challenges and opportunities which are no less important for effective research, development and management.

2.1 Creation and publication

Fisheries information is produced in different regions and countries by a wide range of people and organizations. The research and publishing process varies worldwide and noting the difference is important. The research and management communities in developing countries face different issues and difficulties in publishing than do their counterparts in developed countries. Many of the issues were raised at the Regional Workshop on Networking for Improved Access to Fisheries and Aquaculture Information in Africa, which was held in Grahamstown (South Africa), 3–7 November 2003 (FAO, 2004f) and therefore many of the examples cited relate to Africa, although the issues are common to many countries in other regions.

2.1.1 Issues related to publishing in developing countries

Scholarly journals or grey literature

The editorial boards of scholarly and peer-reviewed journals reject the publications of African scientists because of the lack of up to date citations. However, citing current research articles is only possible if the scientists have access to scholarly journals, which has not been the case in many African fisheries institutions. The result is that most African scientists publish in the form of grey literature, such as institutional reports. In some African countries it is estimated that up to 70 percent of fisheries research is published as grey literature, the remainder in conference proceedings or as theses. Only a small percentage finds its way into scholarly journals. Many papers "published" in Africa are in fact produced by international organizations such as FAO or as a result of working group meetings organized by international bodies, such as the International Commission for the Conservation of Atlantic Tuna (ICCAT).

In 1995, the ACP-EU Fisheries Research Initiative used the ASFA database to identify publications produced by African fisheries institutions as an indicator of the publication and dissemination of research results. One of the conclusions of this study stated "it is apparent from the brief analysis of the literature that the participation in the global scientific community of the region's research institutions is modest" (Nauen, 1995).

Cost

Even publishing grey literature is not without its difficulties. A common problem in research institutions is the lack of funds to publish regularly. In some cases they are not able to publish and distribute the results of their research at all. One example of a regular series that provides access to much of the research on Nigerian fisheries is the Nigerian Fisheries and Aquatic Science Abstracts. Published by the National Institute for Freshwater Fisheries Research (New Bussa) since 1988, the two most recent volumes are compiled on the library computer, unable to be printed and distributed due to lack of funds. A similar situation is faced at the Aquaculture and Fisheries Department of Bunda College in Malawi, which has published two issues of *Aqua-Fish Technical Report*, in 2002 and 2003. The publication has been supported by the Japan International Cooperation Agency (JICA) and external funding is essential to continue this series. Its goal stated in the foreword is to add to the existing body of knowledge on aquaculture and fisheries in Malawi so that policies are formulated based on good science.

Information ownership

Given the difficulties of publishing, African researchers often feel the need to protect their research results rather than share them with colleagues. The whole concept of information sharing is based on recognition of the originator. Such acknowledgement is difficult to achieve when there are limited opportunities to publish. Additionally, validating the research results is impossible unless they reach the appropriate audience. The publishing barriers have a cascading effect on the fisheries community's ability to share, test and use research.

Indigenous and traditional knowledge

Managing knowledge in general and indigenous knowledge in particular has become a valuable input in the management of sustainable development programmes. The growing awareness that indigenous knowledge plays a role in national development is increasing interest in preserving and managing it. The major challenges for libraries vis-à-vis indigenous knowledge relate to collection development, intellectual property rights, access and the preservation media (Ngulube, 2002).

The audience or user community

The publication of commercial journals is determined by economic considerations, i.e. whether there is a profitable market for them. In contrast, much of the fisheries information published in developing countries primarily fulfils the mandate of the originating organization. This poses the challenges of defining the intended audience and how best to communicate the information. The target audience for many fisheries publications includes a wide spectrum of society: managers and policy-makers; researchers, academics and educators; resource users and industry; non-governmental, governmental and international organizations, fishing communities and fishworkers; civil society and last but increasingly not least, the media. The target audience is the key determining factor for how the information is packaged, its language, level and format. The target audience is also a complex and ever-changing aspect of information provision that shapes how information is disseminated and accessed.

Language

The difficulties and cost of publishing in a variety of languages should not be underestimated. For example, the Mekong River Commission (MRC) publishes in Khmer, Lao, Thai and Vietnamese as well as English. These are all official languages however and MRC is aware that to reach all stakeholders there must also be a mechanism for conveying the information in local languages. The role of extension workers in synthesising and communicating information in appropriate forms or the use of radio sometimes offer better options than publishing in local languages.

Packaging information

The importance of publishing information in the most suitable format for the intended audience has long been recognized and in many cases addressed. An area which is receiving increasing attention, but appears to be more difficult to resolve, is how the research community can convey their research findings to policy-makers in a format which enables informed decision making. Similarly, when information is made available to small-scale fishworkers by government agencies, it is often aggregated to a national or regional spatial scale. As a result it often contradicts the fishers' intuitive and local knowledge of the fisheries, even though they are providers of primary data. (des Clers, 2001).

The consequences of not publishing

This lack of opportunity to publish and the loss of the valuable results of research and development programmes lead to the repetition of much of the same work. The consequences of this are the wasting of time and effort and little of the knowledge gained is passed on to subsequent generations. One of the most serious consequences of the low scientific publication rate and high rejection rate is demoralized scientists, high emigration and a loss to the economic development of the country (Hecht, 2004).

2.1.2 Fisheries publications from developing countries

Introduction

An exhaustive review would not be feasible, particularly given the difficulties in identifying and regularly obtaining much of the fisheries literature produced in developing countries. The figures and discussion throughout this section therefore refer mainly to serial publications, including scholarly journals, newsletters, trade and industry magazines, yearbooks and annual statistics, institutional technical, annual and working reports. These are publications with a serial title and consecutive numeration to uniquely identify each issue. Many of these titles would be categorized as grey literature. Nevertheless they include unique, important and difficult to obtain information about the fisheries in the respective countries.

Specific publications are not discussed but some of the organizations mentioned participated as case studies and their publications are covered in more detail in Part 3. The publishing process and format, for example print, digital or audio-visual are not covered in detail. However, the physical characteristics of publications will also determine the means of dissemination and access.

In 1998, the extent of the collection of fisheries serials published in developing regions and held by the FAO David Lubin Memorial Library was evaluated. The overall objective of this project was to create a wider awareness of these publications internationally and to make them more accessible. Given the mandate and history of FAO, the Library includes the most comprehensive collection of fisheries serials from developing countries (Pettman and Collins, 1999). A total of 612 unique fisheries serials titles were identified and added to the IAMSLIC Union List of Marine and Aquatic Serials, which facilitates inter-library cooperation and information resources sharing between libraries at international level.

The following breakdown of the 612 fisheries serial titles by region of publication gives an indication of the quantity of serial titles produced and disseminated.

Table 6: Fisheries journals in FAO Library by region of publication

Region	Number of serials
Africa	139
Asia (excluding Japan)	223
Latin America and Caribbean	147
South Pacific Islands	53
Transitional Countries	49

2.1.3 Some regional and national publishing characteristics

This brief overview examines some regional and country characteristics and differences in the creation and publication of fisheries information. It is intended to give an indication of the scope and the variety of publishing practices. The mechanisms for organizing, managing and disseminating this information are extremely varied. Knowledge of these mechanisms is essential if users are to access the information they need. Several different categories of organization are identified as the most important sources of published fisheries and aquaculture information: regional organizations, national research institutions, government departments, international organizations, non-governmental organizations including societies and professional associations, and donor-funded programmes and projects. The latter include many nationally executed projects in all regions. For our purposes only those regional projects that are publishing extensively have been considered. In addition, the number of trade and industry magazines as well as commercially published journals from developing countries is increasing.

Regional Organizations

The regional organizations and programmes used as examples are those that have significant information and publishing activities. Some publish on behalf of member countries and institutions, while others compile information from member institutions to produce publications on the regional aspects of fisheries. Also of significance are the many regional fisheries bodies and arrangements that are concerned with fisheries management and publish a wealth of information. Some of these are major sources of fisheries publications in their region. These publications are made available to institutions in their respective member countries, internationally and increasingly full-text via the Internet. Further details of these bodies and their publications can be found at <http://www.fao.org/fi/body/rfb/index.htm> (FAO, 2004e).

Three regions in particular can be categorised as concentrating or coordinating much of their publishing and information activity in regional fisheries organizations. Taking into consideration the number of member countries represented, it is obvious that language is an important aspect for both the publishing and accessibility of their information. The following examples indicate the importance of regional organizations in information activities.

South-East Asia has several well-established regional fisheries and aquaculture organizations which publish extensively:

The Network of Aquaculture Centres in Asia-Pacific (NACA)

NACA participated as one of the case studies and further details are included in Part 3. NACA publishes extensively on behalf of its members. Its Internet based publishing mechanism, eNACA, employs a multi-media approach to repackage knowledge for distribution in a wide variety of formats to suit the circumstances and capabilities of different audiences. All publications are made available for download, on CD-ROM and in print. Currently eNACA is distributing 12,000 free publications per month via the Internet. Further information can be found at http://www.enaca.org.

The Southeast Asian Fisheries Development Center (SEAFDEC)

SEAFDEC is an autonomous intergovernmental body established in 1967 to promote fisheries development in Southeast Asia. The Center has a Secretariat and four technical Departments: the Training Department in Thailand, the Marine Fisheries Research Department in Singapore, the Aquaculture Department in the Philippines, and the Marine Fishery Resources Development and Management Department in Malaysia. SEAFDEC is currently made up of ten Member Countries. The various departments produce a large variety of publications on the fisheries and aquaculture of the region, the details of which are brought together on the homepage of the Secretariat at: http://www.seafdec.org/

The Mekong River Commission (MRC)

MRC was established in 1995 by the Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin. There are currently four member countries and regular dialogue with the two upper states of the Mekong River Basin. Details of MRC publications and their availability are online at http://www.mrcmekong .org/index.htm

South Pacific: Regional organizations feature prominently in fisheries management in the South Pacific islands. They are also prominent in the publishing and dissemination of fisheries information in the region.

Secretariat of the Pacific Community (SPC)

SPC is a regional technical and development organization working in partnership with its members, other organizations and donors to deliver priority work programmes to member countries and territories. SPC is the only bilingual (English/French) regional organization covering all 22 countries and territories of the Pacific. Its work programmes aim to develop the technical, professional, scientific, research, planning and management capability of Pacific Island people and directly provide information and advice, to enable them to make informed decisions about their future development and well-being. The Marine Resources Programme, including Coastal Fisheries, Oceanic Fisheries and the Regional Maritime Programme all publish extensively on regional issues. The cross-sectoral information activities at SPC, including health, gender, indigenous and traditional knowledge are all important aspects of

fisheries. Most of their publications are available full-text online as well as in print. Further information: http://www.spc.org.nc/

Caribbean: Fisheries management tends to be organized on a regional basis and the publications of regional organizations are more widely known than the more fragmented publishing pattern of national institutions.

CARICOM Caribbean Regional Fisheries Mechanism (CRFM) has the mandate to promote and facilitate the responsible utilization of the region's fisheries and other aquatic resources for the economic and social benefits of the current and future population of the region. The CRFM is the core of a complex interactive network of a wide variety of stakeholders in fisheries. Membership in the CRFM is open to all CARICOM countries. Publications are listed on the homepage but few are available online. The Caribbean Fisheries Technical Unit works in collaboration with Fisheries Departments in the region to produce additional publications. Further information at <http://www.caricom-fisheries.com/main/publications.asp>

National research institutions and government departments

In terms of the number of regular series published, national institutions produce by far the majority of fisheries publications. This is particularly the case in Africa and South America, where there are few regional organizations dedicated to fisheries and aquaculture and a lower level of publishing activity at regional level compared with Asia and the South Pacific. The publications of national research institutions and government departments fulfil the mandate of the organization to inform policy-makers and the fisheries sector as a whole.

This overview refers to the regular serial publications of national fisheries research institutions, government departments and a few educational or training institutions. Most of them fall into the grey literature category of: institutional reports, including statistics and annual research or administrative reports; project reports and newsletters. Some scholarly journals are published by national institutions in most regions. The following examples provide an indication of the number of fisheries titles published as well as the difficulties in gathering data.

Africa: The data for Africa was gathered as part of an ongoing collaboration that started in 2002 between FAO, the South African Institute for Aquatic Biodiversity (SAIAB) and a group of fisheries institutions in twelve African countries. One of the components of this collaboration is to improve the dissemination of and access to African fisheries and aquaculture publications. An initial exercise identified one hundred current titles produced regularly in the form of series. Searches of international databases and the Internet retrieved only an additional eight African fisheries series titles. Many more fisheries serial publications are being produced in Africa but tracking them down and maintaining regular access is difficult, even at national level (Kadzamira, Ngwira and Salanje, 2004). A complete list of current African fisheries and aquaculture serials was published in the Report of the 2003 Grahamstown Workshop (FAO, 2004f). Brief details are maintained by FAO in the Directory of Fisheries and Aquaculture Information Resources in Africa, available online at <http://www4.fao.org/fishdir>. This illustrates that the vast majority are institutional and project reports or newsletters i.e. grey literature. Almost all are available in print format only and they are available at a limited number of locations. The departments of fisheries in several countries have established newsletters targeted at fishworkers and the fisheries sector as a whole. These provide an important channel of communication, particularly on issues of policy and regulations. Unfortunately many of these newsletters are short-lived, presumably due to lack of funding.

South and South-East Asia: There are obviously vast differences between countries such as the People's Republic of China and India and smaller countries such as Cambodia and Lao PDR, both in terms of fisheries research programmes and the number of publications produced. However, national institutions are producing the most important publications in terms of relevant fisheries content in all

of these countries. For example, the details of more than fifty Chinese journals related to fisheries shows that the majority are published by research institutions, societies and colleges (NOAA Libraries, 2004). A bibliometric analysis of fisheries research in the People's Republic of China between 1994 and 1999 used data from three abstracting databases and three citation indexes. During the six years China published 2035 papers (roughly 4.5 to 5 percent of the world output). More than 95 percent of China's papers were journal articles and about 78 percent of these appeared in 143 domestic journals. Less than one-eighth of the journal articles published by Chinese researchers were published in journals indexed in Science Citation Index, regarded as the high impact journals. Fisheries research institutes and fishery colleges are the major contributors of the Chinese research output in this area. (Arunachalam and Balaji, 2001).

Similarly, India is a prolific publishing country with more than twenty fisheries research institutions plus a number of societies, fishworker and other non governmental organizations that together produce more than forty regular serial titles. A study analysed India's contribution to world literature on fisheries science by mapping fisheries and aquaculture research as reflected in the literature over a six year period (Balaji and Arunachalam, 2000). They analysed six databases for the years 1994-1999 and found that about 460 papers, roughly 5.5 percent of the world output, were from India each year. Eighty two percent of these papers were journal articles, close to 70 percent of them appearing in 113 Indian journals. Less than a third of the journal articles were published in journals indexed in Science Citation Index. About 61 percent of publications are contributed by government laboratories and over 25 percent by academic institutions. Government laboratories publish most of their work in low impact and low visibility journals and academic institutions in journals of medium impact. Balaji and Arunachalam went on to note that although China's research output and its citation impact are less than those of India, China's fish production and export earnings are far higher than those of India. The results of their bibliometric comparison led them to comment that probably China is better at bridging the gap between know-how (research) and do-how (technology and creation of employment and wealth) and also that China is strong in extension.

In contrast to these large, populous countries, both Lao PDR and Cambodia have few institutions working in fisheries and consequently they produce relatively few serial titles. However, the publishing pattern is similar inasmuch as national research and governmental institutions are the major producers of fisheries information in both countries. The Living Aquatic Resources Research Centre (LARReC), established in 1999 in Lao PDR is the only fisheries research institution in the country. It publishes two regular series, some of which are available full text via Mekonginfo at <http://www.mekonginfo.org/>. Other relevant publications are produced infrequently by NGOs and projects. The Department of Fisheries in Cambodia administers one freshwater and one marine fisheries research institute and publishes a Technical Report series online at <http://www.maff.gov.kh/e-library/e-fishlibrary.html>. An overview of information exchange within the fisheries sector of Cambodia also identified the Khmer language *Cambodian Fisheries Newsletter,* published quarterly by the Department of Fisheries as well as an Annual Report (Mee *et al.*, 2003).

South America: An overview of institutions and organizations with fisheries related programmes in eight South American countries, Cuba and Ecuador was presented at the IAMSLIC Conference in 2002 (Cosulich and Silvoni, 2003). The paper analyses the results of a survey of the specialized information units of these institutions and discusses their collaboration in information-related activities as well as possibilities for the future. The thirteen South American institutions in their survey are characteristically governmental, including universities and national research institutions. Of the twenty three serial titles produced by the South American institutions surveyed, 50 percent are from national fisheries research institutions. South American institutions with fisheries related programmes are responsible for the publication of a large number of fisheries serial titles e.g. FAO Fisheries library has 59 current serial titles from this region. The library of Instituto Nacional de Investigacion y Desarrollo Pesquero (INIDEP) in Argentina recorded 55 current serial titles with the following breakdown: 11 published in Argentina, 15 in Brazil, 4 in Colombia, 8 in Chile, 2 in Ecuador, 6 in Peru, 8 in Uruguay and 1 in Venezuela. Very few of these are so far being published in digital format via the Internet.

Donor-funded regional programmes and projects

Large regional fisheries projects in the past have been implemented by international organizations such as FAO. Traditionally they published extensively on topics relevant to the individual member countries or on regional aspects of fisheries. One example of this type of project is the Bay of Bengal Programme, which during 28 years of implementation produced more than 220 publications on the fisheries of the region. Similarly, the South China Sea Fisheries Development and Coordinating Programme between 1973 and 1985 produced over 180 publications. Projects provided opportunities which did not otherwise exist for local research and development workers to publish. Many of these publications contain unique information and are still in demand.

More often nowadays, ongoing regional programmes, funded by a mixture of bilateral, national and intergovernmental agencies, publish their information via Internet-based interactive and participatory web sites. Two of the examples of projects publishing fisheries and aquaculture information via the Internet are based in Asia and the third in Africa:

Support to Regional Aquatic Resources Management (STREAM). The regional STREAM Initiative aims to offer support to the livelihoods of poor peoples who manage aquatic resources. STREAM is hosted in Bangkok by the Secretariat of the Network of Aquaculture Centres for Asia-Pacific and plans to cover up to 15 Asia Pacific countries. The STREAM Virtual Library provides access to a wealth of publications by theme, by country, and by serial title.<http://www.streaminitiative.org/>

Mekonginfo is an interactive system for sharing information and knowledge about participatory natural resource management in the Lower Mekong Basin. Mekonginfo provides a variety of information services, in addition to over 4,000 documents in full-text, including a free Web hosting service. Mekonginfo is currently hosted by the Mekong River Commission. <http://www.mekonginfo.org>

Sustainable Fisheries Livelihoods Programme (SFLP) based in Cotonou, Bénin. SFLP is a partnership between the Department for International Development (DFID), the Food and Agriculture Organization of the United Nations (FAO) and 25 participating countries in West Africa. The SFLP seeks to address the problem that information is lacking among fisheries communities and decision-makers. The SFLP communication strategy as a support to development activities is reflected in concrete terms through social communication (dialogue, consultation, participatory analysis of situations, decision-making etc), educational communication (sharing experiences and best practices, organisational development, sectoral information, etc.) and institutional communication (creating information flow, informing decision-makers, etc.). To facilitate the sharing of knowledge and the dissemination of lessons derived from SFLP experience, an Internet communication network linking the 25 countries has been put in place. The extensive publications of the project are freely downloadable from the website <http://www.sflp.org/eng/index.html>

Non-Governmental Organizations (NGOs)

Many small NGOs, particularly at the national level, are actively involved in fisheries and aquaculture. Besides publishing newsletters and reports, they are generally more actively publishing on the Internet than are national institutions in some regions. Publishing relevant information for fishworkers and their associations is a major objective of many NGOs. They also inform the global community by covering the situation at grass roots level. The ICSF is an active information producer and works at international level. Further details of its mandate and information activities are covered in Part 3 and Annex 5 with case studies. The publications of NGOs are important for fisheries and often fill a gap between the impact of global decisions on local communities and their livelihoods.

Societies and Associations

Examples of the scholarly and peer-reviewed publications of professional societies are found at both national and regional level. They provide an opportunity for developing country scientists to publish in widely known and widely distributed journals. In terms of access they are similar to commercial journals but their availability at reasonable rates to members makes them an important source of information in developing countries. At national level, the *Journal of Aquatic Sciences* published by the Nigerian Association of Aquatic Sciences and the *Journal of the Indian Fisheries Association* are good examples. Some Conference Proceedings are also regularly published as a series, for example the *Fisheries Society of Nigeria, Annual Conference Proceedings*.

Even wider coverage is provided at regional level, for example Asian Fisheries Science, published by the Asian Fisheries Society and the newly launched Western Indian Ocean Journal of Marine Science published by the Western Indian Ocean Marine Science Association (WIOMSA). Asian Fisheries Science was launched in 1987 in response to the need of fishery professionals in Asia for a reputable journal that they could afford to subscribe to and in which they could report their scientific findings.

India provides an interesting example of the benefits for the publishing process of professional associations and societies. A number of associations are based at the various research institutions, for example the Indian Fisheries Association (Central Institute of Fisheries Education, Mumbai), Inland Fisheries Society of India (Central Inland Fisheries Research Institute, Barrackpore), Society of Fisheries Technologists (Central Institute of Fisheries Technology, Matsyapuri). At the sixth Indian Fisheries Forum held in 2003 there were several suggestions on the need to strengthen the fisheries journals published by the various associations. These covered the need for certain uniform and co-ordinated norms for the benefit of fisheries scientists to strengthen the scientific base of fisheries developmental work in the field (Fishing Chimes, 2003).

Trade and Industry

There are several examples of newsletters and magazines published by the fisheries industry in developing countries, in particular Latin America and Asia. Apart from South Africa, no examples are known from other African countries. They provide up-to-date information on the current fishery situation in the country and bring relevant global information to their readership.

Scholarly Journals

This is the category of commercially published journal, which in developed countries would be published primarily by private for-profit companies. Often in developing countries it is still the professional societies and universities that publish scholarly journals on a commercial basis. As was pointed out earlier these journals are more likely to be regarded as having low impact on the scientific community at large and are often not well known outside the country of publication (Balaji and Arunachalam, 2000). Since the advent of online systems which disseminate the scholarly journals published in developing countries, a whole new spectrum of fisheries related information has become accessible. Examples of these services are given in Part 2.2.2. Many of the journals included in these systems are multidisciplinary, are not well indexed by international fisheries databases and their content was not previously well known by fisheries users.

2.2 Dissemination and accessibility of fisheries publications produced in developing countries

The previous section provided a brief overview of the fisheries publications produced by different types of organization in developing countries. The quantity and diversity of these publications poses challenges for libraries, which have to organize and manage information as a service to users, and for individuals who need easy and cost-effective access to fisheries information. Its accessibility is made more complex because of the issues already mentioned i.e. the subject area is broad and

multidisciplinary, it has depth in terms of time and perspective and it encompasses scales from local to global. These factors make it essential for institutions and libraries to cooperate and to share the available information resources.

One of the biggest challenges for information providers in recent years is the impact of decentralization and other changing forms of fisheries governance. In the past, those seeking published fisheries information had an institutional affiliation with an established infrastructure to provide it. Now, the audience has broadened to include smaller local units of governance and the fishing community. This section mainly addresses the dissemination and accessibility of the type of fisheries information provided by libraries i.e. for the formal sector or those working in institutions or organizations. However, the information needs of the informal sector or those with no institutional affiliation should also be addressed if fisheries management is to succeed at local level.

The accessibility of locally produced publications is inseparable from the policies and mechanisms for its dissemination. Dissemination includes the ways in which people are made aware of a publication and sometimes, but not always, details of its availability. This may or may not enable the user to obtain or have access to the full text of the publication, depending on issues such as cost or the availability of the Internet.

2.2.1 Issues related to the dissemination and accessibility of local publications

The audience or user community

Just as the target audience determines the content and packaging of information, it also determines how information is disseminated so it can be discovered and easily accessed. As was already mentioned, the target audience is a complex and ever-changing aspect of information provision. For example, the trend towards decentralization passes responsibility to smaller and diverse units of society that normally do not depend upon the formal structure of organizations and institutions for their information. Similarly, the availability of information via the Internet is changing the way fishworkers seek and use information, as well as the way they approach administrators and managers (K. Koranteng, personal communication, 2004). Knowing the audience is all-important for the providers of information and library services. The primary audience, usually the staff of the parent institution, is relatively easy as close working relationships ensure that the information needs are known. More difficult are the secondary and external users. A Nigerian study to find the differences between scientists and policy-makers in the way that they approached information, found that only 59 percent of information made available to policy-makers suits their needs. Timely information was the most important criterion for this group and information written in simple lucid language the second (Ibeun, 2004). In addition to the shifting audience, the dynamic nature of fisheries means that the information needs also shift. For example, the expanding needs for information in aquaculture for policy-making, planning and management have been attributed to growing concerns over sustainability and the environment (Cho, 2001). Issues related to the changing audience as well as their changing information needs are relevant for the provision of global as well as local information.

Assessment of information needs

There have been many case studies at the individual country and local community level to identify the categories of users and to assess their information needs. Specific information needs can only be assessed at this level as there is neither a global picture nor a universal solution. A study on the information needs, information-seeking behaviour, and the impact of information use on artisanal fishers and extension agents at three major lakes in Uganda highlighted the importance of understanding the kind of information needed to carry out different functions (Ikoja-Odongo and Ocholla, 2003). The methods they favour for accessing information are described, and the role of government departments in fisheries information provision is described. The range of information needed is mainly to resolve specific problems, is very wide and is largely obtained from within the community or via the radio. Information is also obtained from formal sources, although to a much

lesser extent, including the Fisheries Department, NGOs, local and other government departments and fisheries associations.

An information access survey carried out by STREAM in Viet Nam noted specific information needs at community level, including technical information, and the preferred means of access. Also noted were the poor level of information sharing and communication between the various agencies and projects in Viet Nam and the fact that research results rarely reach the local pool of knowledge. (Felsing and Nguyen, 2003).

Many of the issues related to information needs and channels of access in these and other country level studies are common. These include:

- the gaps, such as the lack of adequate information on fisheries resources or lessons learned in fisheries management;
- the inadequate packaging and presentation of information for different audiences;
- the physical location of information in relation to the location of users;
- the publishing of information as research or technical reports that are rarely available locally and are primarily accessible through tertiary level institutions or government departments;
- the lack of an effective mechanism for information gathering;
- the costs of access including the time involved;
- the ability to absorb information that is determined by educational level and health;
- the levels of literacy and the language requirements of the audience.

Several regional studies have also identified information needs e.g. (Southern African Development Community, 2001), although these are necessarily of a more generalized nature and often reflect the need for sharing expertise and information at regional level.

2.2.2 Mechanisms for dissemination

Distribution of publications

Distribution is the physical delivery of publications, often confused with dissemination, which is the employment of various mechanisms to create an awareness that the publications exist. In Part 2.1 it was mentioned that the costs involved in the production and distribution of publications can be prohibitive for many institutions. Compounding this problem in some regions, for example many of the countries in Africa, is the lack of an adequate and reliable infrastructure for postal deliveries to be effective. As a result the distribution mechanisms are poor and institutions often rely on meetings and personal visits as the only opportunity. This certainly impedes distribution to countries outside of Africa, but they are often poorly distributed between African countries and in some cases even within the country of publication. For example, there are relatively few fisheries institutions in Malawi producing a small number of publications. The staff of Bunda Library conducted site visits during 2003 and collected 61 fisheries publications which they had not previously been aware of and which were not covered by international fisheries databases. None of the institutions surveyed in Malawi, apart from the academic institutions, has a policy or mechanism to ensure that local publications are easily and readily accessible to other users, either within or outside the country.

Exchange agreements

Institutions maintain exchange agreements with similar institutions in part to mitigate some of the expense of distribution by the availability of external publications relevant to their work. Agreements offer a relatively inexpensive way to develop library collections. Often the fisheries libraries in developing countries are responsible, at least in part, for the publishing programme of their institution as well as for building and maintaining the directory of exchange partners. This arrangement helps to ensure that distribution is targeted and that relevant publications are received in exchange.

The FAO Fisheries Library has exchange agreements with many fisheries institutions in developing countries. While difficult and time-consuming to maintain a current collection, these publications are vital to many FAO Fisheries Department programmes of work. Interestingly, FAO receives many more developing country publications than do other institutions in the same region. There are frequent examples of these publications not being available in other libraries in the same country. The exchange agreements of the institutions participating in the Grahamstown Workshop showed more active programmes with institutions in developed countries than with neighbouring countries. At the same time, the sharing of fisheries information at regional level is given high importance in the objectives of almost all regional programmes and projects.

Local publications in library collections

Notwithstanding the grey nature of most African fisheries publications, the specialized collections of local publications are the most heavily used resources in many institutions. They include the results of fisheries research and development in Africa and provide the most relevant content for the fisheries sector as a whole. Two examples of this type of collection are the Malawi fisheries and aquaculture collection at Bunda College of Agriculture (Lilongwe) and the Nigerian fisheries and aquatic sciences collection at the National Institute for Freshwater Fisheries Research (New Bussa). Both institutions emphasize the importance of their specialized collections of local publications, which are organized and searchable in-house by means of CDS/ISIS bibliographic databases.

These collections of local fisheries publications are regarded as the most important information resources by their institutions and by external library users, who in many cases travel considerable distances to access them. Nevertheless, even at national level they are difficult to keep up to date and comprehensive because of publishing costs, lack of awareness and inadequate distribution.

Coverage in international databases

As previously mentioned, the fisheries publications produced in developing countries fall largely into the grey literature category, which by definition is difficult to track and obtain. In many cases the problem is compounded by the lack of financial resources to improve their production, dissemination and distribution. This has a definite negative impact on the capture and coverage of this information in international databases, which still provide the main mechanism for dissemination to an international audience.

The ASFA partnership enhances access to local fisheries information through incorporation into this major bibliographic database (FAO, 2004b). The need for improved coverage of African publications, particularly those from francophone Africa, has long been recognized (Kaba, 2004). FAO provides the Secretariat for ASFA, which coordinates the input of records from over fifty input centres around the world. Kaba attributed the poor coverage of African literature in part to the small number of ASFA input centres in sub-Saharan Africa, four in 2003 and only one of those in francophone West Africa. The language of input, predominantly English, is one barrier to participation. Another is the lack of resources necessary to act as an input centre. Kaba suggests that national and subregional networks to enable collaborative input to the database in Africa would provide a means to improve coverage and to build a body of expertise. Since the Kenya Marine and Fisheries Research Institute (KMFRI) became the first African ASFA partner and input centre in 1996, the coverage of literature produced in Eastern Africa has greatly improved. Commencing in 2004, the participation of Nigeria, Mauritania and Tanzania as ASFA input centres will further increase coverage of African fisheries publications.

The International Information System for the Agricultural Sciences and Technology (AGRIS) is another international bibliographic database coordinated by FAO and mandated to cover all the sectors in which FAO works, including fisheries. Some 240 national, international and intergovernmental centres participate in AGRIS and the coverage of fisheries publications by some countries is good. Searching AGRIS for fisheries information from these countries is essential. However, searching

AGRIS for the world's fisheries literature is less comprehensive than ASFA. The overlap between AGRIS and ASFA can be confusing to some information seekers.

In cases where input to fisheries databases is centralized at an institution in a developed country, the coverage of African literature is often better. For example, Kaba indicates that there is generally better coverage of the francophone African fisheries publications in the HORIZON database produced by l'Institut de recherche pour le développement (IRD). Le Fonds Documentaire of IRD (FDI), a bibliographic database with links to full text documents, <http://www.bondy.ird.fr/pleins_textes/> integrates almost all research publications produced since the 1960s in francophone Africa. However, this approach does not integrate the information with the global literature at international level.

Several commercially published databases, such as CABI, include fisheries although they tend not to cover the grey literature published in developing countries. The publisher NISC produces the Aquatic Biology, Aquaculture and Fisheries Resources (ABAFR) database, which includes developing country fisheries literature. The NISC South Africa (NISC SA) partner ensures strong coverage of the African literature in particular. NISC SA evaluated the coverage of African fisheries publications in the ASFA and ABAFR databases in 2002 (Lawrie, Crampton and Hully, 2004). Almost 50 percent of the serial titles identified were not located in either of the databases. Additionally, those serials that are indexed by either ASFA or ABAFR are not always covered in full. From the point of view of international database publishers, the main difficulties in covering these titles are lack of awareness of their existence, lack of current contact information and the disproportionate amount of time and cost involved in trying to obtain them.

Repositories of fisheries and aquaculture publications

The digitization of fisheries publications and the opportunities for dissemination, as well as the challenges for preservation it provides, can overshadow the existing wealth of print resources. The inadequate preservation of fisheries publications in many developing countries and the unavailability of previous research and development findings often results in a continuous repetition of work, a waste of resources and loss of the experience gained from one generation to the next. The national library in many countries acts as a repository for all national publications, although fisheries institutions are often unaware of the advantages of this arrangement, in particular as a means of preservation. A case can be made for regional repositories where the resources for preservation and access at national level are inadequate and where an institution is either mandated or willing to take on the task.

SAIAB Library in South Africa has offered to act as a repository for all print African fisheries and aquaculture publications. A mechanism has already been put in place with several institutions and their current publications are being supplied to SAIAB. In addition to the responsibility of providing access to these publications, SAIAB will provide its own journals on an exchange basis. This arrangement would also ensure better coverage of African fisheries literature in the ABAFR database by means of the collaboration between SAIAB and the publisher NISC SA.

Dissemination and access via Internet

The Internet increases the opportunities for dissemination and the visibility of fisheries publications, although the proportion from developing countries is still relatively small compared with the enormous amount of information from the developed world. Their accessibility by many institutions in developing countries is also limited by the lack, or the inadequate bandwidth, of Internet connectivity.

An indication of the number of fisheries journals which are disseminated via Internet can be found in the FAO Fisheries Library's online directory of journals at <http://www.fao.org/fi/ library/journ.htm>. The level of content provided by each journal is variable, from basic availability details, tables of contents and abstracts to those which are available in full text. Out of approximately 400 fisheries and aquatic science journals in the directory, about 20 percent are published in developing countries. This

figure includes the journals published by regional and international organizations working in developing countries.

In recent years there has been a proliferation of web based systems and services to disseminate scholarly journals from developing countries. One such service to provide access to African published research and increase worldwide knowledge of indigenous scholarship is African Journals Online (AJOL) <http://www.ajol.org>. AJOL currently covers over 200 journals, including the following core aquatic sciences and fisheries journals:

African Journal of Aquatic Science (South Africa)
Journal of Aquatic Sciences (Nigeria)
Tropical Freshwater Biology (Nigeria)
African Journal of Tropical Hydrobiology and Fisheries (Uganda)

Many of the multidisciplinary journals covered by AJOL also include fisheries and aquatic sciences articles. The contents tables and abstracts are available via Internet with the option to order copies of the full text article, either at no cost for the poorest countries or against payment for the rest.

A system for the dissemination of scientific and technical serial publications from Latin America is the Scientific Electronic Library Online (SciELO), which has established publishing policies, standards and quality criteria. The general goal of the SciELO Project is to contribute to the development of national scientific research by improving and expanding its means of dissemination, publication, and evaluation through the intensive use of electronic publishing. In the short term, the SciELO Project intends to radically increase the national and international visibility, accessibility and credibility of the Latin American and Caribbean scientific publications, through the integrated publishing of national and regional collections of scientific journals on the Internet. In the long term, the project envisions to increase the impact of the scientific literature from these regions. The coverage includes several journals relevant for fisheries but no core fisheries titles. Further information:
<http://www.scielo.org/index.php? lang=en>

Several systems provide Internet access to journals from developing countries, although the coverage of fisheries journals is not comprehensive. Their stated goal is to make the information available to the international research community world-wide. One example is Bioline International (BI), a not-for-profit electronic publishing service committed to providing open access to quality research journals, including those published in developing countries. BI's goal of reducing the South to North knowledge gap is crucial to a global understanding of health, biodiversity, the environment, conservation and international development. With peer-reviewed journals from Brazil, Cuba, India, Indonesia, Kenya, Nigeria, South Africa, Uganda, Zimbabwe BI makes the bioscience information generated in these countries available to the international research community world-wide. BI does not cover any core fisheries or aquatic sciences journals but several of the multidisciplinary ones include fisheries subjects e.g. *Journal of Applied Sciences and Environmental Management* published in Nigeria <http://www.bioline.org .br/journals>.

Further work is needed to analyse the usage statistics of these systems. Such comparison of the rate of access by developing country scientists compared with access from developed countries would demonstrate the relative value of these systems.

Digitization programmes

The opportunities for publishing, as well as improved dissemination and distribution will be much greater when full-text online publishing via the Internet is a realistic possibility for fisheries institutions in developing countries. At present it is mainly the regional fisheries organizations in developing countries, such as NACA and SPC, which are publishing digital documents and disseminating them full text via Internet. Few national fisheries institutions are systematically making available their publications in full-text digital format. Several are planning to do so and one of the

hazards for the future seems to be that digitization is being planned with different partners, different formats, different metadata standards and different methodologies for the preservation and archiving of digital publications. Future developments in open archives, digital repositories, metadata harvesters and other necessary tools of the digital age will only be effective if agreed standards are adopted.

Efforts are being made, for example in IAMSLIC and IFLA, for libraries to collaborate now to ensure the adoption of agreed standards, thus avoiding the incompatibility problems which face most library catalogues today. A project started in 2004 by the Intergovernmental Oceanographic Commission (IOC) of UNESCO in cooperation with Limburg University (Belgium) intends to create a digital repository of African fisheries and oceanography publications. The starting point will be digitization of the publications of the IOC focal points in 20 African countries, the ODINAFRICA partners. Further information can be found at http://www.odinafrica.net.

2.2.3 Constraints to accessibility

Most of the issues presented refer to access to information via libraries by those affiliated to government departments, research or educational institutions i.e. the formal sector. Many of the constraints on libraries in developing countries to provide effective access to information are not only faced by the fisheries sector. A recent UN report (United Nations Economic and Social Council, 2003) discussed the value of library services in development and very clearly stated the constraints faced in many developing countries. The report also highlighted the opportunities which libraries provide to harness information and knowledge for the benefit of education, empowerment and economic development.

In order to propose mechanisms for improved access to information it is necessary to have a better understanding of where the constraints originate and why. The focus of the following is on Africa. However, the constraints are common in many developing countries and are not uncommon in developed countries.

Institutional constraints

Funding: Library governance in general is not well defined. A perpetual problem of libraries is finding the correct niche so that the library budget is measured alongside the information needed for effective research and development. Too often the library is grouped with administration in the institutional structure and its costs are seen as purely administrative. Libraries in this scenario are competing with, for example, scientists for scarce financial resources and the competition is seldom on an equal footing. The result is that the library budget is inadequate, and in some cases non existent, for the acquisition of publications and access to information. The differences between countries as well as the cultural differences in how libraries are valued also need to be taken into account.

Qualified staff: Some governmental institutions do not have an established post which requires a qualified professional to head information services. Many of the constraints identified at the Grahamstown Workshop were attributed to the lack of *real* government support for an information infrastructure, policy and development at national level. This is seen as the main reason for the lack of adequately qualified staff in many fisheries and other governmental research institution libraries. The provision of specialized subject-based library services requires staff qualified at least to graduate and preferably to post-graduate level. They should be motivated, have career prospects and have the support of the institutional hierarchy.

Inadequate library collections: The situation reported by many national fisheries institutions indicates that basic library collections are inadequate to support growing fisheries research and management programmes. In addition to the very low library budgets for the purchase of information resources, the lack of adequate methods for the dissemination and distribution of national publications means that even these collections are far from complete and current. In the absence of adequate distribution, or at least a system of alerting people to the existence of publications, there is obviously

low awareness of them. Cases where the library staff has to travel long distances to the various publishers of relevant information in their country are not uncommon. Apart from the inefficiency of this arrangement it is also dependent on the availability of funds. For example in Malawi only the two academic institutions out of the seven fisheries related organizations surveyed have a policy or mechanism to ensure that local publications are easily and readily accessible to other users. This applies to users in Malawi as well as to those outside the country. As a result, most publications are kept in individual offices and are not organized or catalogued in any way. (Kadzamira, Ngwira and Salanje, 2004). At the same time students and researchers in some countries are forced to travel long distances to libraries in order to obtain the information they need. The research grants in some institutions include travel to other countries in order to obtain information. Donor programmes such as those of the International Foundation for Science give grantees an amount to cover the purchase of information during their research. None of these examples contributes to the availability of information in the long term, either at institutional or national level. Consequently many libraries in developing countries rely almost entirely on donations and free distribution of the publications of international organizations.

National constraints

Government support for an information infrastructure and development at national level is of primary importance. Many developing countries are disadvantaged by an inadequate information infrastructure and by the lack of a functional national information policy to guide development. The success of national library and information networks depends upon some degree of coordination and agreement on the norms and standards to be adopted. In developing countries this role would normally be performed by government. The lack of effective inter-library cooperation at national level in many countries contributes to even weaker access to information in resource-poor situations. For example, fisheries libraries rely heavily on national socio-economic, trade, environmental and other information related to the particular country. In the absence of a national system to foster information exchange, access is severely limited. Rosenberg questions the relevance of information resource sharing in Africa and concludes that the underlying problems which have caused the decline in information services must be solved before libraries can benefit from networking (Rosenberg, 1993). Most of these problems have to be solved at national level.

The cost of publishing in multiple languages is a constraint in many countries. Limitations exist even taking into consideration only the official languages. For example India has thirteen official languages and the barriers to information access are well illustrated in a country like Uganda, which has fifty-six local languages. Users are also confronted with the problem that most information systems do not cater for multiple languages in their search and retrieval functions.

2.2.4 Existing strategies to improve access at national level

Information resource sharing and networking

The information on the fisheries in a specific locality or a specific country is normally the most important resource for the sector as a whole in that country. Organizing, managing and disseminating this information is one of the most important functions of the libraries of national institutions concerned with fisheries. Ensuring that this information is accessible by all at the level where livelihoods are concerned and fisheries management is implemented is a major challenge. The maintenance of local collections and their dissemination to all stakeholders is more effective where libraries collaborate at the national level. This ensures that locally generated information is used and consequently validated. The broad subject base of fisheries makes it essential that libraries provide a wide range of information. However, inadequate budgets and institutional missions often preclude a multidisciplinary collection. Inter-library cooperation at the national level is therefore essential to provide access to the breadth of fisheries-related information, including environmental and general science, socio-economics, legislation and information on national markets and trade. To facilitate the exchange of information, fisheries libraries should adopt national standards in the development of their

own information systems. This is particularly true where human and financial resources are limited and the country cannot yet support technological diversity. Compatibility applies to national metadata standards and library software as well as digitization standards. However, in order to share information resources at regional and international level, libraries must also adopt specialized subject metadata standards. For example, taxonomic and geographic terminologies are very important in fisheries. Standards must be adopted which allow information to be disseminated and shared across systems.

Few fisheries libraries in Africa are members of national library networks that are well developed, formal networks with stated objectives, benefits and obligations. Two examples of the latter type of network in Africa are the Ghana Agricultural Information Network System (GAINS) <http://www.csir.org.gh/gains.html> and SABINET Online in South Africa <http://www.sabinet.co.za/>. The fisheries institutions in both countries participate in these networks and are able to access a much wider range of information at national level, in particular the non core but important related subject areas. South Africa has the most comprehensive collections of fisheries literature in Africa and the most well developed library network for sharing resources. However, many other countries in Africa do not have such well established library networks, at least from the point of view of the fisheries libraries. The study on *Fisheries information needs in Asia* noted that on the whole fisheries information centres and libraries in Asia operated independently or in isolation (Cho, 1995). A recent example of library networking at national level is in Viet Nam with the Fisheries Information Centre at the Ministry of Fisheries as coordinator. Participants include the four fisheries and aquaculture research institutes, national universities and vocational schools with fisheries programmes. A shared fisheries library database is being established to facilitate resources sharing. (Felsing and Nguyen, 2003).

The need for a very broad range of diverse information resources strengthens the case for participation in library networks at national level. In cases where national inter-library arrangements exist and are able to satisfy peripheral subject requests, the availability of fisheries literature is often limited via these channels. This is particularly the case in those countries which have only one or at most two fisheries institutions. In most African countries, the fisheries institutions do not have access to the global fisheries information and documentation they need at national level and depend upon regional and international cooperation to obtain it.

2.3 Access to global fisheries information in developing countries

Introduction

Access to the large volume of information published mainly in developed countries and available either on a commercial or an exchange basis is critical to fisheries science and responsible management. The availability in many developing countries is limited because of the high costs or the requirements of exchange agreements. Many fisheries meetings have reported that the lack of access to timely and relevant information is a major constraint to the development and management of fisheries and aquaculture. However, there is little reference to what those information needs are or how they can best be met. For example, there is little published on the information resources that are available locally and to what extent these are being used to satisfy information needs at national level. It is essential that we understand the existing mechanisms and how they can be improved before trying to fill information gaps, particularly when financial resources are limited. Information costs are high, not just the one-time acquisition or access transaction, but ensuring long-term access for future generations also involves the costs of organization and preservation. Cost effective mechanisms need to be explored so that information needs can be satisfied over the long term.

2.3.1 Issues related to the accessibility of global information

The value of information and libraries

Many of the issues and constraints related to access to local fisheries information also apply to global information. For example, the physical location of information, the gaps in information, the time and costs involved in gathering information are equally relevant. These issues are invariably related to economic factors and the concept of information value is not well documented in the fisheries literature. There is rarely any calculation of the cost of duplicating research or of loss of livelihood, or even life, as a result of the lack of information. Whereas commercial publishers are well aware of the costs and the "value" of information in terms of profits, there is little evidence of an equivalent awareness of the value of information in fisheries research programmes or institutional budgets. This is possibly because of the difficulty of measuring the impact of information on an individual or an institution, not to mention society in general.

Studies have been carried out which contribute to an understanding of the value of libraries in various sectors and situations. For example, *The Value of Library Services in Development* which was published in 2003 suggests that a return on investment analysis should be used in demonstrating the monetary value of libraries to their parent organizations and communities. The funding of libraries should be viewed as profitable investments in development and as the provision of public goods which help in the efficient use of scarce financial resources (United Nations Economic and Social Council, 2003).

Internet connectivity

The International Telecommunication Union (ITU) in its World Telecommunication Development Report 2003 states that as we enter the new millennium, almost every country in the world has a direct connection to the Internet. ITU goes on to point out that, although this is an impressive achievement, Information and Communication Technology (ICT) penetration levels vary among and within countries, creating a digital divide between those with high and those with low access levels. Measuring access level as a simple per capita function is convenient and useful for comparing general differences between countries but it can be misleading about the situation within countries.

In addition to global comparisons and statistics on Internet access, there are many studies on the situation in individual countries or regions, although for our purposes only the status in fisheries institutions is of interest. For example, an Information Access Survey (IAS) in Cambodia was carried out by the Support to Regional Aquatic Resources Management (STREAM) programme in 2002. The purpose of the IAS was to identify and recommend means of communication that are appropriate to aquatic resources management stakeholders, focusing in particular on poor rural communities (Mee, *et al.*, 2003). The findings of this report are common to many developing countries i.e. the Internet remains an urban phenomenon and is expensive. It is not widely available to government offices and many research institutions, particularly outside the capital city, and NGOs are more likely to have access to both e-mail and the Internet than are fisheries researchers and managers. However, the level of Internet access in many fisheries organizations, institutions and communities in developing countries is improving. For example, the Internet connection at Bunda College of Agriculture improved from a 14KB dial-up line to a 64KB radio link in 2004. However, the actual problems of low bandwidth and high cost have still to be resolved.

Fisheries institutions in many developing countries are slowly progressing towards full and more reliable Internet access. In the interim and until access is affordable, substantial numbers in the fisheries sector rely on print and other media. Their information needs must also be taken into consideration for as long as is necessary.

Multidisciplinary and transdisciplinary information

As has already been stated, fisheries rely upon a broad subject base of information. However, inadequate budgets and institutional missions often preclude a multidisciplinary library collection. In addition, the lack of overlap between many of the disciplines involved in fisheries means that the core literature must be supplemented from related areas such as oceanography, environment, economics, rural development and sociology. According to a recent article, the lack of resolution of many fisheries management problems is attributed in part to the insularity of the different disciplines (Pontecorvo, 2003). He suggests that there is little interaction between fisheries biologists, economists and oceanographers because of the disciplinary language barrier and the need to protect a political position.

Whatever the reasons, providing access to the full spectrum of fisheries information is too costly for most individual institutions. Inter-library cooperation for the sharing of information resources, and therefore costs, is more well-established in the developed world than it is in many developing countries. These arrangements can take many forms, including shared acquisition or access consortia and shared or interoperable catalogues to facilitate speedy access to each other's collections.

The audience

The audience considered in this section is the formal sector of researchers, educators and managers affiliated to institutions and organizations that normally obtain information via libraries. The situation from country to country is very different in terms of scale. Several case studies identifying the relevant organizations and the information used were presented at the Grahamstown Workshop (FAO, 2004f). For example, Malawi identified seven institutions with fisheries programmes and carried out an in-depth survey of users, the publications produced and the information needed (Kadzamira, Ngwira and Salanje, 2004). By comparison, this level of analysis was not possible for Nigeria which identified over 40 institutions with fisheries programmes and a further 36 State Departments of Fisheries (Ibeun, 2004).

In addition to the staff of the institutions, categorized as the primary library users, the other groups identified were students, NGOs and increasingly the private sector. Few libraries identified civil society as a primary audience.

Assessment of global information needs

Specific fisheries information needs in developing countries in terms of scientific and other scholarly literature is not well documented. An exception is the study in Nigeria on the information sources used by Nigerian fisheries scientists and policy-makers (Ibeun, 2004). Having ascertained that journals are the most frequently consulted source of information, effort was made to identify the core journal titles. One hundred and eight relevant journal titles were identified and the twenty five most frequently consulted journals were checked against library holdings. Researchers consult what is available in the library or what they can obtain directly from authors or colleagues. The article concludes that gaps in the collection and the lack of current subscriptions means that Nigerian fisheries and aquaculture scientists are not exposed to current issues in fisheries internationally and are therefore not part of the global information village.

Other assessments have tended to concentrate on the type of information needed e.g. policy or science; or on the type of user e.g. fisheries resource user or policy-maker. A comprehensive study on the fisheries information needs and opportunities in Asia in 1995 suggested that existing efforts are relatively successful in organizing and disseminating published scientific and technical literature, but they are not effective in meeting the information needs of the key actors in aquatic resource management (administrators, managers, policy-makers and planners, coastal communities, and aid and development agencies). The same study noted that only a few national fisheries libraries in Southeast Asia had access to international information sources such as ASFA, AGRIS and other bibliographic or full text databases. Of the twelve national fisheries libraries in six countries that the author visited only

one had an ASFA subscription. This was explained by the fact that information providers in Southeast Asia do not actively use international information sources. The key reasons given were: (1) the information sources and services are not well known to many information providers; (2) access to the sources is not convenient; (3) language and professional barriers make it difficult to effectively use international sources and services; and (4) materials found in the international sources are not relevant to the needs of their users (Cho, 1995). This situation has changed dramatically, particularly in those countries with reliable and affordable Internet access. There is increasing demand and increasing availability of fisheries databases such as ASFA and full text journals via AGORA in many Southeast Asian countries. Many of the key reasons for lack of access in 1995 are much less relevant today.

Several regional projects and initiatives have identified information needs in connection with capacity building and the strengthening of regional collaboration in the management of fishery resources. The Regional Fisheries Information Project (RFIS) of the Fisheries and Marine Resources Sector Coordinating Unit of SADC (Southern African Development Community) was implemented between 2001 and 2003. Information needs assessments concentrated more on statistical data, information technology and the Internet-based exchange of information than on the broader needs for scientific and related information. However, the project stated that the expressed information needs for effective fisheries management cover both data and information. The project objectives included support to the information requirements of regional organizations promoting the management of shared marine resources and to support the development of regional human capacity in this area. Reports covering the project outputs are available at: http://www.sadcfisheries.com/doc.asp. Another example is the ACP-EU Fisheries Research Initiative, which promoted interdisciplinary research and emphasized strengthening regional and subregional cooperation through the promotion of joint information systems as a pre-requisite for regional fisheries management programmes. Access to further information and some of the Initiative reports can be found at <http://europa.eu.int/comm/development/body/theme/research/bkgen.htm>

In connection with implementation of the Access to Global Online Research in Agriculture (AGORA) service, a survey was carried out to ascertain which journals are available and which are needed by the research and academic communities in eligible countries. The responses from fisheries-related institutions indicated that journal subscriptions which were held in the 1980s and 1990s were in most cases discontinued due to lack of funds. The fisheries journals most frequently cited as relevant are shown in Table 7.

Table 7: Fisheries journals cited as the most important in the AGORA survey

Journal title	Journal title
African J.Aquatic Sciences	Fisheries Management and Ecology
Ambio	Fisheries Oceanography
Aquaculture	Fisheries Research
Aquaculture Nutrition	Fishery Bulletin
Aquaculture Research	ICES J. Marine Sci.
Aquatic Conservation:Mar.and Fresh.Eco.	Journal of Exp.Mar.Biol.and Ecol.
Aquatic Living Resources	Journal of Fish Biology
Bamidgeh: Israeli J.Aquaculture	Journal of Fish Diseases
Botanica Marina	Journal of Plankton Research
Bulletin of Marine Science	Journal of the World Aquaculture Soc.
Canadian J.Fish andAquatic Sci.	Hydrobiologia
Coastal Engineering	Limnology and Oceanography
Coastal Management	Marine and Freshwater Research
Conservation Biology	Marine Biology
Coral Reefs	Marine Ecology Progress Series
Deep Sea Research	Marine Pollution Bulletin
Ecology of Freshwater Fish	North American J.Fisheries Management
Environmental Biology of Fishes	Océanologica Acta
Estuarine, Coastal and Shelf Sciences	Progress in Oceanography
Fish and Fisheries	Wetlands Ecology and Management

Africa: During the past three years FAO has been working with a small group of African fisheries libraries to identify specific information needs and to propose ways of improving access, including information resources sharing activities. This activity is building upon another FAO project which started in 1999 to provide African fisheries institutions in LIFDCs with the ASFA database, initially on CD-ROM and ASFA Online where Internet access is available. This initiative is having a positive impact on the information capacity of recipient institutions. They have reported that the database is proving useful in their research and development activities and that the bibliographic data and abstracts enable them to identify essential publications.

However, many institutions also reported that they have difficulty in locating and then obtaining copies of the necessary documents, in print or digital formats. This appears to be a fairly widespread problem for fisheries and aquaculture institutions in Africa and has been identified as a major constraint to research in particular. To try and alleviate this problem and find ways to improve access to fisheries and aquaculture information and documentation, FAO Fisheries Department initiated a small project in collaboration with SAIAB. The SAIAB Library has a comprehensive collection, historical as well as current, including over 600 current periodicals in the aquatic sciences. The main objective of the collaboration was to work with a core group of fisheries libraries, to collect more specific data on the information needed and to propose mechanisms for improving access to fisheries publications. In order to collect better data, the SAIAB Library provides documents (print or digital) to the participating institutions or the requests are re-directed to alternative sources, including online resources, obviously bearing in mind any copyright restrictions.

SAIAB's role in coordinating the flow of requests and queries, i.e. acting as the hub of the network, is based on the excellent resources of its Library and the willingness of SAIAB to explore ways of making these resources available for the benefit of fisheries institutions in other African countries. As

part of the National Research Foundation, SAIAB is one of the partners in the Africa Interaction Programme which aims to expand scientific cooperation between scientists in South Africa and their counterparts in the rest of Africa.

The overall objectives of the project are to enhance the information capabilities of fisheries institutions and to strengthen the links between fisheries libraries through South-South and North-South collaboration. It focused on three separate but related areas of activity, mainly because of the different levels of complexity. These areas were document request and delivery; information resources sharing and improved dissemination of African fisheries publications. The diversity of the participating institutions did not make a significant difference in terms of the information required. The need for information in the same sources was found to be the most important element in the collaboration. Whether the institution is freshwater or marine, research or academic, Francophone or Anglophone, in southern, western or eastern Africa is less relevant than their needs for global fisheries information.

Even during the first year of network activity, it became obvious that the institutions need a much broader and deeper subject base of information than merely the current core aquatic science journals (FAO, 2004f). During 2002 a total of 504 documents were requested, including articles from 248 different periodical titles, of which only 107 fell into the aquatic sciences category i.e. regarded as core journals. The dates of publication requested showed a definite need for older as well as current literature. Almost 25 percent were for pre 1980 articles, 35 percent were published in the 1980s, 32 percent in the 1990s and less than 8 percent from 2000 onwards. The most frequently requested titles were commercially published journals, often expensive and probably not held by any fisheries libraries in most African countries.

During 2003 the statistics show requests for 195 different journal titles and publication years dating back to the 1940s. Compared with 2002, a much greater proportion of requests were for more recent material. This could be explained by the fact that the libraries had a backlog of requests for older articles which they had previously been unable to obtain. Also, the impact of using ASFA or ABAFR for the identification of more recent material was beginning to emerge.

In both years, there were few requests for journals published in Africa, although in 2003 some titles began to appear in the statistics. One example is the *Global Journal of Pure and Applied Sciences,* published in Nigeria. A possible explanation is that these journals are often interdisciplinary and, although they include fisheries articles, they are not adequately monitored by the international databases ASFA and ABAFR. The extremely wide range of journal titles requested and the large number of articles published before 1990 also indicate that even when we achieve full Internet connectivity and online access to full-text current documents, many of the requests will still have to be satisfied from print collections.

Table 8: Most frequently requested journals by number of requests

2002		2003	
Title	**No.**	**Title**	**No.**
Journal of Fish Biology	15	Aquaculture	15
Hydrobiologia	14	Journal of Fish Biology	14
Aquaculture	13	Environmental Biology of Fishes	12
Transactions of the American Fish. Soc.	9	Global Journal of Pure and Applied Science	10
Canadian J. of Fisheries and Aquatic Sci.	7	Crustaceana	8
Indian Journal of Fisheries	7	Copeia	6
Zeit. Mikros. Anatom. Fors.	7	Canadian J. of Fisheries and Aquatic Sci.	4
Journal of Aquatic Animal Health	6	Hydrobiologia	4
Marine Policy	6	North American Journal of Aquaculture	4
Archiv fur Hydrobiologie	5	Aquaculture Research	3
Fish and Shellfish Immunology	5	Bangladesh Journal of Training and Dev.	3
Journal of Applied Ichthyology	5	Economic Affairs (Calcutta)	3
Science	5	Fisheries Research	3
Acta Anatomica	4	Journal of Aquatic Plant Management	3
Bulletin of Marine Science	4	Journal of the Helminth.Soc.Washington	3
Diseases of Aquatic Organisms	4	Journal of Zoology	3
Folia Parasitologica	4	Netherlands Journal of Sea Research	3
Indian Journal of Helminthology	4	North American J. of Fisheries Management	3
Journal of Food Technology	4		
Onderstepoort J. of Veterinary Research	4		

Table 9: Total requests by year of publication

2002		2003	
Decade	**No.**	**Decade**	**No.**
No date	36	No date	4
1920	1	1920	-
1930	1	1930	-
1940	6	1940	1
1950	4	1950	1
1960	18	1960	3
1970	84	1970	31
1980	166	1980	34
1990	152	1990	138
2000	36	2000	128
Total	504	Total	340

In both years there were a fairly high percentage of requests which could not be met (40 percent in 2002 and 31 percent in 2003). Two reasons explain most of the unfulfilled requests:

- journals requested were from a wide range of disciplines other than fisheries and aquatic sciences;

- books and theses were requested but for reasons of copyright and unreliable postal services could not be supplied.

Libraries were encouraged to reduce their requests to SAIAB for peripheral subjects and requests for journals published in Africa were directed to an institution in the country of publication wherever possible. The subject areas of the journals requested could be broadly classified into five main groups, namely:

- aquaculture, fisheries;
- zoology, entomology, parasitology, genetics;
- veterinary science;
- agriculture, food science, environmental science;
- sociology, rural development.

The need for diverse information resources across many subject areas strengthens the case for participation in library networks at national level, in particular for the peripheral and related subject areas. Such cooperation expands access to information while sharing the cost and avoiding duplication of resources and effort.

2.3.2 Existing strategies to provide access to global fisheries information

Full text online journals

Internet access to full text digital information provides a huge opportunity for the international fisheries community. Internet also offers potential for the publication and dissemination of information generated in developing countries. Already in 2003, fisheries libraries in Ghana, Malawi and Uganda were able to access full text journals thanks to the International Network for the Availability of Scientific Publications (INASP). The Library Support Programmes of INASP <http://www.inasp.info/lsp/index.html> include training, capacity building and improved access to information. However, the fisheries libraries in many countries are outside of the mainstream and are unaware of the larger multidisciplinary initiatives available in their country. There is a need for awareness-raising and some degree of training or hands-on experience with the multitude of new services becoming available.

Since the launch of AGORA at FAO in 2003, over 350 institutions in 53 countries have registered to use the service. AGORA provides access to over 500 scholarly journals in the broad agricultural and environmental sciences. Fisheries institutions are well represented amongst those registered and core fisheries and aquatic science journals are ca. 12 percent of the total. Registering with these services is the first step but it must be followed up by activities of awareness raising, user-training and regular updating on the availability of new journals and new systems. Those libraries without adequate Internet access to be able to benefit from AGORA and other full text services must depend to an even greater degree on collaboration with other libraries. The commercial publishers have strictly adhered to eligibility criteria for free online journal access, which normally depend upon national income levels. <http://www.aginternetwork.org>

Table 10: Fisheries and aquatic science journals available via AGORA

Ambio (BioOne)	Journal of Animal Ecology (Blackwell)
Aquacultural Engineering (Elsevier)	Journal of Applied Ichthyology (Blackwell)
Aquaculture (Elsevier)	Journal of Applied Phycology (Kluwer)
Aquaculture International (Kluwer)	Journal of Aquatic Ecosystem Stress and Recovery (Kluwer Academic)
Aquaculture Nutrition (Blackwell Publishing)	Journal of Crustacean Biology (BioOne)
Aquaculture Research (Blackwell Publishing)	Journal of Exp.Mar.Biol.and Ecol. (Elsevier)
Aquatic Botany (Elsevier)	Journal of Fish Biology (Blackwell)
Aquatic Conservation (John Wiley and Sons)	Journal of Fish Diseases (Blackwell)
Aquatic Ecology (Kluwer)	Journal of Marine Systems (Elsevier)
Aquatic Toxicology (Elsevier)	Journal of Molluscan Studies (Oxford U. P.)
Biological Invasions (Kluwer)	Journal of Oceanography (Kluwer)
BioScience (BioOne)	Journal of Paleolimnology (Kluwer)
Continental Shelf Research (Elsevier)	Journal of Plankton Research (Oxford U.P.)
Copeia (BioOne)	Journal of Sea Research (Elsevier)
Deep Sea Research (Elsevier)	Lakes and Reservoirs (Blackwell Publishing)
Dynamics Atmospheres and Oceans (Elsevier)	Marine and Freshwater Research (CSIRO)
Ecology of Freshwater Fish (Blackwell)	Marine Ecology (Blackwell Publishing)
Environmental Biology of Fishes (Kluwer)	Marine Environmental Research (Elsevier)
Estuarine Coastal and Shelf Science (Elsevier)	Marine Policy (Elsevier)
Fish and Fisheries (Blackwell Publishing)	Marine Pollution Bulletin (Elsevier)
Fish and Shelfish Immunology (Elsevier)	Northeastern Naturalist (BioOne)
Fish Physiology and Biochemistry (Kluwer)	Ocean and Coastal Management (Elsevier)
Fisheries Management and Ecology(Blackwell)	Physical Oceanography (Kluwer Academic)
Fisheries Oceanography (Blackwell Publ.)	Progress in Oceanography (Elsevier)
Fisheries Research (Elsevier)	Reviews in Fish Biol. and Fisheries (Kluwer)
Fisheries Science (Blackwell Publishing)	River Research and Applications (John Wiley)
Freshwater Biology (Blackwell Publishing)	Society of Wetland Scientists Bull. (BioOne)
Global and Planetary Change (Elsevier)	Southeastern Naturalist (BioOne)
Harmful Algae (Elsevier)	Water, Air and Soil Pollution (Kluwer)
Hydrobiologia (Kluwer Academic)	Wetlands (BioOne)
ICES Journal of Marine Science (Elsevier)	Wetlands Ecology and Management (Kluwer)
International Review of Hydrobiol.(Wiley)	

Access to full text commercial journals is only one piece of the digital cake. Because of the nature of fisheries research, development and management and the involvement of government institutions, professional associations and NGOs, there is a preponderance of grey literature. Many of these publications are available online free of charge via the Internet. FAO maintains a list of these journals, currently about 150 titles, at http://www.fao.org/fi/library/jou_free.htm. INASP also maintains a Directory of Free and Open Access Online Resources which includes databases and some journals, although few core fisheries resources <http://www.inasp.info/peri/ free.html>.

An initiative to enable scientists in institutions or countries with unreliable, inadequate or costly Internet access to retrieve the scholarly journal articles they need is the electronic Journals Delivery Service (International Center for Theoretical Physics, 2004). eJDS is part of the Abdus Salam International Centre for Theoretical Physics (ICTP) / Third World Academy of Sciences (TWAS) Donation Programme. It facilitates access to current scientific literature free of charge via e-mail <http://www.ejds.org>

Open access and open source

UNESCO's communication and information sector programme encourages the use of free and open source software (FOSS). In the digital age, software is essential for knowledge management and sharing. UNESCO has therefore accumulated significant experience in facilitating the development of some key software tools for processing information. These software tools are distributed free-of-charge and the objective is to empower the users by giving them access to some key technology for development and knowledge sharing, that most of them otherwise could not afford. The development model is based upon international cooperation and the software tools are continuously enriched, modified and updated with the cooperation of a community of experts from different countries. The most popular UNESCO software tools are CDS/ISIS, Greenstone and IDAMS <http://portal.unesco.org /ci/en/ev.php-url_id=17450&url_do=do_topic &url_section=201.html>

In addition to the free full-text grey literature, several of the open access initiatives to provide scholarly journals include fisheries related journals. Open access journals are defined as journals that use a funding model that does not charge readers or their institutions for access. An example is the Directory of Open Access Journals (DOAJ), based at Lund University Libraries, Sweden. This service covers free, full text, quality controlled scientific and scholarly journals. DOAJ aims to cover all subjects and languages and currently has over 1 300 journals in the directory. Of these several are fisheries related but at present only four core fisheries and aquaculture journals are covered.

International Organizations

Organizations of the United Nations system in general supply relevant publications and information to national institutions in member countries. Fisheries related information originates in many UN agencies in addition to FAO, including the International Maritime Organization (IMO) and the United Nations Environment Programme (UNEP). Some international organizations also implement programmes to improve information capacity e.g. the FAO projects to provide the ASFA or ABAFR databases and AGORA to national fisheries institutions in eligible developing countries.

Library consortia

Libraries everywhere are forming consortia to jointly fund the acquisition or access to information resources, in particular electronic and full text resources. There are many examples of recently established library consortia in developing countries. The Aquaculture and Fisheries Department of Bunda College benefits as a member of the recently established Malawi Library and Information Consortium (MALICO) by having access to additional information resources. The lessons learned and experience gained in the establishment of this consortium will be useful for other libraries considering taking this step (Ngwira, 2004).

Library networking at regional level

Fisheries resources and their management, in addition to the vital role played at local level and in the national economy, are also often regional in nature. One only has to look at the examples of the African Great Lakes, the Mekong River, the Eastern North Pacific, the Gulf of Mexico, and the Mediterranean Sea to realize that without regional cooperation and the sharing of information there is little hope for the responsible management and development of fisheries. The many regional fisheries organizations, in addition to the regional fishery management bodies, are evidence of the importance of the "regionality" of fisheries. These same organizations and bodies also offer opportunities for sharing information resources. It is important that the experience, the lessons learned and the research results of national institutions are shared between countries in the region in order to strengthen this regional collaboration. Providing access to the broad fisheries information base is only possible if libraries cooperate at regional level.

Some examples of former and current regional networking efforts are:

Southeast Asia: The 1995 study on *Fisheries information needs in Asia* noted that on the whole fisheries information centres and libraries in Asia operated independently or in isolation. Several information networks which had been established in Asia with donor funding, especially in the 1980s, rapidly declined or ceased to function altogether once the funding terminated. For example, the Southeast Asian Fisheries Information System (SEAFIS) commenced in 1984 under the coordination of SEAFDEC (Cho, 1995). The SEAFIS objectives were to facilitate the exchange of information between national fisheries institutions; provide access to current fisheries documents; expand the collection of non-conventional literature; and train staff of national centres in modern information handling methods. The reason for the demise of SEAFIS is given by the funding agency as the lack of regional focus and the dominance of one of the national partner systems (IDRC, 1999). There is still little evidence of collaboration or networking between libraries at regional level in Asia. Notably, Asia does not yet have a regional group of IAMSLIC. Regional organizations such as NACA and MRC have improved the dissemination of information and visibility of partner institutions. How the partner institutions obtain the local, regional and international information they need in order to carry out research and development does not appear as part of the mission of these regional organizations.

Africa: The Ocean Data and Information Networks of the Intergovernmental Oceanographic Commission (IOC) of UNESCO are made up of the IOC focal point institutions in various regions. The most well-developed of these is ODINAFRICA, based at the Kenya Marine and Fisheries Research Institute (Mombasa), which originated in 1989 as the Regional Co-operation in Scientific Information Exchange - Western Indian Ocean (RECOSCIX-WIO) project. The benefits for the respective libraries of this project have included the provision of computers, library software and extensive training. Further information about the current information activities of ODINAFRICA can be found at <http://www.odinafrica.net/>. A more recent collaboration between FAO, SAIAB and libraries of several national fisheries institutions is working to promote information resources sharing and assess the requirements for a longer-term regional network. Data and information has been collected over a three year period to determine more specifically the information needs and current mechanisms used to provide access. More effort is needed in Africa to assess existing collections, systems, capacities and the potential of a network. The main contribution so far by network participants has been in the sharing of information and expertise, their eagerness to provide better information services to their institutions and their willingness to collaborate with other libraries inside and outside the region.

Constraints to regional network development

The many examples of regional networks which have not survived once the external funding source is no longer available should provide us with lessons for the future.

Human and institutional factors: Regardless of the technological developments in information management and access, the individual and institutional ability and commitment to sharing information resources are the most important elements. Libraries all over the world are renowned for operating on the basis of cooperation and the sharing of resources. However, some kind of formal or informal agreement is necessary in any kind of networking arrangement. An agreed modus operandi is probably even more necessary in the context of few resource-rich libraries and very many resource-poor partners. The following requirements are considered essential:

- institutional support;
- commitment of the library or documentation centre staff;
- financial support for coordinating activities;
- the benefits to the institution must outweigh the level of input required.

The areas of constraint considered most in need of attention are:

- institutional inequality with some net givers and some net receivers;
- different methodologies and standards of cataloguing and indexing;
- different software standards, IT capacity and internet accessibility;
- poor postal infrastructure and the lack of hardware and software to enable electronic document transmission;
- conflict and duplication of effort with existing national and regional networks.

The need for standard methodologies for information exchange: A comparison of the various methodologies for cataloguing, classification and indexing as well as the library software used by African fisheries libraries was presented at the Grahamstown Workshop (FAO, 2004f). There is very little standardization in terms of database structure or metadata. The most commonly used cataloguing software in developing country libraries is one of the versions of CDS/ISIS which is developed and distributed free of charge by UNESCO. Several fisheries libraries are using the ASFIS methodologies for classification and indexing of their collections, i.e. the indexing techniques developed by the ASFA partnership for creation of the database. The use of agreed standards would improve indexing and enhance information exchange. Without external funding there is little possibility to change current systems.

Library networking at international level

Last but not least are the international aspects of fisheries, including not only the fisheries resources themselves, but fisheries agreements, legislation, management bodies, trade, and the very ecosystems of which the resources are a part. To enable us to have access to and share the relevant information resources internationally, the very broad "aquatic community" must develop common standards for the systems and tools necessary for their management.

There are many initiatives in the development of fisheries information systems and tools at international level. Two examples of these from international organizations are:

FAO: The ASFA partnership contributes to information capacity by providing training, enabling the sharing of expertise and providing access to global fisheries information. The ASFA project makes the database freely available, currently to more than forty national institutions in LIFDCs. Access to AGORA is an FAO coordinated project that provides libraries in the poorest countries with free access to over 500 full text journals, including major fisheries journals (FAO, 2004a).

UNESCO: One of the two major concentrations of UNESCO's communication and information programme is "fostering equitable access to information and knowledge for development" (UNESCO, 2003). Part of this focus concerns greater participation in global information networks with an action being to increase the capacity of libraries. As an active supporter of open source software, UNESCO continues to develop, disseminate and promote information management tools, including the Greenstone Digital Library software and the CDS/ISIS bibliographic software, including the recently released Integrated Library system WEBLIS.

Future developments in open archives, digital repositories, metadata harvesters and other necessary tools of the digital age will only be effective if agreed standards are adopted. International organizations play their part in this effort, as do professional associations such as:

International Federation of Library Associations (IFLA) is promoting digitization standards and offering training in developing countries. Some countries will adopt national standards for digitization and fisheries institutions would benefit from participating in these initiatives. UNESCO recently contracted with IFLA and the International Council on Archives to produce comprehensive guidelines to digitizing collections (International Federation of Library Associations, 2002).

IAMSLIC provides a forum to discuss and encourage participation in the use of technology to enhance access to aquatic science and fisheries information. Its activities include:

- information resources sharing via the Z39.50 Distributed Library and the Union List of Marine and Aquatic Serials. Expanding coverage to include the unique serial holdings of member institutions is ongoing;
- supports local initiatives with small grants, such as the training grant given to Bunda Library;
- forum for sharing expertise and information provided by annual conference, proceedings, newsletter, electronic bulletin board;
- participatory development of a web-based subject portal.

Bearing in mind that the systems and tools developed by IAMSLIC are done so using the expertise of its members on a voluntary basis, the following activities are ambitious. However, fisheries libraries, particularly in developing countries, would benefit by entering the discussion and contributing towards these developments:

- uniform guidelines for metadata standards and agreed vocabularies are needed;
- promoting institutional and regional repositories for the aquatic sciences;
- implementation of a harvester for existing appropriate institutional repositories;
- adoption of basic digital library guidelines so members have a baseline to use when initiating projects.

The current development of digital repositories and harvesters expand the capability of libraries in all parts of the world to share local, regional and international information. A brief overview of the IAMSLIC framework for improved sharing of aquatic science information is given in Annex 6.

3. OPPORTUNITIES AND CHALLENGES RAISED BY THE CASE STUDIES

3.1 Introduction to case studies

Providing the information needed in support of fisheries management presents libraries with a variety of opportunities and challenges. Close examination of libraries and information centres[15] in developing countries focuses the general discussion on more specific issues and local solutions. A comprehensive survey of libraries was not feasible and instead four case studies were selected to illustrate the variety of issues as well as to discover common issues and strategies.

The four case studies represent the diversity of fisheries institutions and organizations in terms of their size, focus, geographic location, governance and audience. Two African national institutions were selected as representative of major organizations producing and disseminating information in the region. The Institut mauritanien de recherches océanographiques et des pêches is a governmental oceanographic and fisheries research institute in a francophone country with a regular publications output. The Bunda College of Agriculture is an academic institution with one focus on inland fisheries and aquaculture; it plays a regional educational role and produces a limited number of publications.

The other two organizations studied, one intergovernmental and one non-governmental, are based in Asia and have well-developed online information systems. The International Collective in Support of Fishworkers is an international non-governmental organization with an international audience, a focus on artisanal fisheries and fishworkers and extensive digital publications. The Network of Aquaculture Centers in Asia-Pacific is an inter-governmental, regional organization building a digital information system on aquaculture with and on behalf of partners and collaborators.

While our information collecting methodology varied, library or documentation centre staff completed a standard questionnaire focusing on publishing activity and digitization efforts and plans. Their current publishing output was reviewed. The methodologies used to create databases were compared with Basic Dublin Core. In interviews, the participants discussed issues, constraints and opportunities concerning access to fisheries information. If available, the institution's website was examined.

Each case study is described briefly, highlighting its institutional context, facilities, collections, Internet connectivity and partnerships. The reasons for inclusion as a case study are noted in Table 11 and the specifics on methodology discussed in Annex 5. This sets the background for the ensuing discussion of opportunities and constraints on accessing information in developing countries. Rather than outline these under each case study, there is more value to examining them as a whole. The strategies developed must address as many constraints and opportunities as possible to be successful.

The reasons for selecting the four case studies are briefly summarized in Table 11.

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[15] Libraries include information and documentation centres. Librarians refer to those who work and manage these entities.

Table 11: Reason for selecting case studies

	Bunda College	IMROP	ICSF	NACA
Geographic location	Malawi	Mauritania	India	Thailand
Type of institution/organization	National academic	National scientific	Non-governmental	Inter-governmental
Focus	inland fisheries and aquaculture	marine fisheries and oceanography	artisanal and small-scale fisheries	aquaculture
Audience	Local, national and regional	Local, national and regional	International	Regional, international
Facility	Good library, adequate Internet	Good library, adequate Internet	Fast Internet, good IT	Fast Internet, good IT
Use of current technology	Good	Good	Extensive	Extensive
Interest in digitization of publications	High	High	Experienced	Experienced
Publication output	limited and manageable	limited and manageable	active and manageable	active and manageable
Network participation	FAO / SAIAB, University of Malawi	ODINAFRICA FAO/SAIAB	International partners	NACA partners
Library networks	MALICO, AFRIAMSLIC, IAMSLIC	AFRIAMSLIC, IAMSLIC		

3.1.1 Bunda College of Agriculture Library, University of Malawi

Case study methodology

A site visit to Bunda College was conducted from 6 May through 11 May 2004. During this time, the following tasks were addressed:

- the digitization questionnaire was completed.
- the professional staff members were interviewed.
- the local Malawi Fisheries and Aquaculture Database was examined.
- the publication output was documented.
- selected users were interviewed.

Additional checking of both the local database and the publications produced in Malawi was completed at FAO Headquarters. Other resources provided valuable insight (South African Development Community, 1995; Coche and Collins, 1997; Ngwira, 2003; Kadzamira, Ngwira and Salanje, 2004; Ngwira, 2004).

Background

Bunda College of Agriculture, as part of the University of Malawi, focuses on natural resources and agriculture including aquaculture and fisheries (Coche and Collins, 1997). The Library has ample space for the print collection and readers as well as satisfactory wiring for Internet connectivity. The Internet connection recently improved from a dial-up connection to a radio link. Library staff is responsive to the needs of the students and faculty even though funding is limited. The collection is funded with grants that are periodic and often subject specific

The collection has approximately 40,000 books, 10,000 bound periodicals as well as several CD-ROM databases, including ABAFR and CABI. In the past two years, electronic access to full text resources through AGORA and INASP PERI has expanded the collection immensely. There is a large gap in the journal collection when project funding ceased and before electronic access commenced. Recent funding from ICEIDA through the Aquaculture and Fisheries Department has enhanced the monograph collection in that subject area. Additionally, the faculty of that department has worked with the library to increase the coverage of the locally developed Malawi Fisheries and Aquaculture Database to include all reprints requested by the department. Copies of the documents indexed in the database are added to the main collection or if an article or not easily catalogued, added to the special collection.

The Library is a founding member of MALICO which was established in May 2003 to bring libraries together to share expertise, issues and facilitate access to information resources (Ngwira, 2003). MALICO provides the vehicle for country-wide negotiations with PERI, Bio-One and other providers of free or reduced cost electronic resources. The Library also belongs to IAMSLIC and the Malawi Library Association. Both of these provide training opportunities and means of sharing expertise.

Digitization has not commenced at the Bunda College Library although staff is well aware of possibilities and the technology. Scanners and adequate computer storage exist within the Library. Staff members have solid knowledge of database management through use of CDS-ISIS. They have begun to evaluate the Greenstone Digital Library software as one tool for developing digital collections. They are reviewing their current thesauri for consistency and coverage. The Library supports the Open Access movement and is learning more about the Open Archives Initiative.

3.1.2 Institut mauritanien de recherches océanographiques et des pêches

Case study methodology

Mr Amady Sow, IMROP's Librarian, spent three days at FAO Headquarters in spring of 2004. During this period, the following tasks were addressed:

- the digitization questionnaire was completed.
- digitization and information access issues were discussed.
- a list of IMROP serials was created.

As follow-up to Mr Sow's visit, the data input formats used were gathered and background information on the IMROP compiled. Studies or reports on Mauritanian fisheries are largely institutional planning documents, statistical reports on fisheries and scientific articles. Various ODINAFRICA documents were read to gain an understanding of information networking in the country as well as IMROP planning documents (UNESCO, 2000; UNESCO, 2001; UNESCO, 2002: Holland and Wheater, 2003).

Background

Originally created in 1952, the Institute focuses on building knowledge about the fishing and ocean resources of Mauritania. Programmes include stock assessment, evaluating constraints on artisanal fisheries, marine mammal studies, variability and durability of Mauritanian upwelling, and seafood inspection. IMROP is a member of ODINAFRICA and participates as a national oceanographic data Centre, collecting data via research vessels and coastal stations.

The library staff is aware of developments in information management, delivery and access. A strong collection of 8500 volumes and 92 serial subscriptions is enhanced by the addition of electronic access to full text resources through AGORA. *Horizon et Pleins_Textes*, an Internet-based access tool developed by the Institut de recherche pour le développement, provides access to French language scientific and development information. CDS ISIS has been used for more than 12 years for collection management. As part of the ODINAFRICA network, the library system is being migrated to

INMAGIC although CDS ISIS may still be used for certain operations. IMROP became an ASFA Input Centre in April 2004 and will use the WWW-ISIS-ASFA software for input

The library is also responsible for editing and distributing the IMROP Bulletin and other institutional publications. Additionally, the Library collects papers and theses produced by Mauritanian scientists. Digitization of all of these is a long-term project that is currently in the planning stage. While not aware of the Open Archive Initiative per se, the Library has great interest in making the institution's reports more accessible to a broader audience which their inclusion in the ASFA database will assist. As a member of the ODINAFRICA network, the IMROP Library may be a pilot partner in a digital repository for that network. Equipment for creating and storing digital documents is housed in the library.

3.1.3 International Collective in Support of Fishworkers

Case study methodology

A site visit to the ICSF Headquarters in Chennai was conducted 5-7 May 2004. During this time, the following tasks were addressed:

- the digitization questionnaire was presented.
- discussions held with ICSF staff
- a publications list was drafted.

Following the site visit, the ICSF Documentation Centre completed and returned the questionnaire with copies of the database entry forms and the keyword list used for indexing ICSF publications. The publications list was completed and reviewed by ICSF staff for accuracy. The ICSF web site was examined with particular attention paid to the organization of its digital publications. Other resources including various ICSF publications and more general articles on information issues in India provided background (ICSF, 2004; Kurien, 1988, 2000; Malhan and Gulati, 2003; Rama and Takalkar, 2000).

Background

The ICSF is an international non-governmental organization. It "works towards the establishment of equitable, gender-just, self-reliant and sustainable fisheries, particularly in the small-scale, artisanal sector" (ICSF 2004). The ICSF monitors issues that relate to the lives of fish workers around the world, prepares guidelines for policy-makers that emphasize participation and sustainability, and encourages the development of alternatives in the small scale fisheries sector. This sector focus gives ICSF a unique role in responsible fisheries management and dissemination of information.

The ICSF Documentation Centre (DC) was established in 1999 as a depository and clearing house for fisheries information with a focus on artisanal and small-scale fisheries. Subject areas of particular interest include working conditions, fishworkers unions, social security, women in fisheries and fishing technology. The DC's primary audiences are fishworkers, their organizations, national authorities and the international community working on these issues.

The DC collection includes 5400 books and documents, 100 journals, news clippings from 1994 on issues related to fisheries, 6800 photographs, 55 videos and 70 CD ROMs. The DC staff manages its collection using WINISIS with a locally developed thesaurus for subject descriptors. Beyond managing the collection, the DC also produces publications addressing small-scale fishery issues. Products range from CD-ROMS to ICSF's report, *Samudra*, which is published in three languages, three times a year in both print and digital format. The organization is committed to disseminating its publications widely and finds that digital access is appropriate for much of it audience. Consequently, much effort has been expended to make publications available as easily downloadable files on ICSF's well designed web site. The DC has experience in digitization and web design and also harnesses external expertise for digital publication, web services and storage.

3.1.4 Network of Aquaculture Centres in Asia-Pacific

Case study methodology

Mr Simon Wilkinson, NACA's Communications Manager, was interviewed during his visit to FAO Headquarters 25-26 May, 2004. During this period, the following tasks were addressed:

- the digitization questionnaire was completed.
- digitization and information access issues were discussed.
- a list of NACA serials was created.

As follow-up to Mr Wilkinson's visit, the serials list was refined and background information on NACA compiled. The NACA web site was examined with particular attention to the organization of its digital publications and their searchability. Other resources, including various NACA publications, provided additional background (Barnes and FAO, 1981; Bueno, 2003; Cho, 2001; Cuerden, 1976; Felsing and Ngyuen, 2003; Friend, 2001; Mee *et al.*, 2003; Network of Aquaculture Centers in Asia-Pacific, 2001, 2004; Wilkinson, Sim and Suansook. In press).

Background

NACA, an intergovernmental organization created in the early 1980s originally as an FAO project, promotes rural development in 16 Asia-Pacific countries through sustainable aquaculture. The current member governments include Australia, Bangladesh, Cambodia, China, Hong Kong SAR, India, Korea (DPR), Iran, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Thailand, and Viet Nam. Other participating (non-member) governments include Indonesia, Rep. of Korea, Lao PDR and Singapore. The members form a Governing Council that directs policy and activities. FAO is a non-voting member of the council. NACA conducts development assistance projects throughout the region in various partnerships. NACA supports institutional strengthening, technical exchange and the development of policies for sustainable aquaculture and aquatic resource management

One of NACA's core activities is the development of communication and information networks amongst the member countries. Its Information Centre, staffed by one manager, and one computer engineer, is charged with producing the publications, developing a web-based platform for storing and distributing digital documents, and providing technical assistance in communications to the members. While a small print collection is maintained, the Information and Communication Program focuses on information in digital format as the best means of sharing it widely, quickly and affordably. Consequently, NACA produces all publications in digital form, delivered primarily by download from the website. CD-ROMs are also created for distribution to offline centres. Most publications are also produced in printed form as part of an ongoing commitment to accessibility. NACA reformats members' information, collects other appropriate digital content and supports communities of users through its web site. XOOPS, an Open Source web content management / community portal software, is used for the NACA web site, PageMaker for the serial publications and PDF formats for other digital content.

3.2 Issues of enhancing access to fisheries information

Five common issues emerge from the case studies:

a) Identifying publications
b) Collecting publications
c) Sustaining access to resources through existing networks
d) Maintaining library staff capacity and expertise
e) Assisting users with information

There is obvious overlap with the issues concerning creation and publication of fisheries management information and its dissemination and accessibility discussed in Part 2. Elements also reflect the COFI identified constraints to implementation of the Code. In this part, each issue is framed, and examples given from the case studies.

Identifying publications

Identifying what fisheries scientists and managers are publishing is central to providing better access. Of particular concern are local publications or those unique to the organization's mission. The means of identifying publications may vary by location and type of institution; however, it is a shared task and often not simple.

Bunda College
Fisheries scientists and managers in Malawi are active producers of information. The flow is not overwhelming so should be relatively easy to identify and collect. But it is not. Announcements of publications or institutional publication lists are not currently generated. The various fisheries institutions are geographically dispersed so there is no easy regular communication or sharing of publications.

IMROP
The IMROP Library oversees the production of the institution's publications so there is no difficulty in collecting those which are published officially. Identifying relevant publications that are outside the regular publication stream is more problematic. One example is tracking down student theses; these are publications of the university rather than the Institute though much of the work is funded and executed at the Institute. Publications done in cooperation with international partners are often published outside Mauritania, and are difficult to identify consistently.

NACA
Monitoring the publications from the 16 member countries of NACA is demanding. Many are governmental reports with limited distribution. Not all are relevant to aquaculture or NACA's audience, which includes both aquaculturists and policy-makers. Complicating identification is the multiplicity of languages published.

ICSF
Identifying publications is simplest when there are geographic or subject area boundaries that set limits to where to search for relevant information. The ICSF Documentation Centre is challenged to define its collection as the geographic scope is international and the subject multidisciplinary.

Collecting publications

Once publications are identified, it is often problematic to collect them due to limited print runs and lack of distribution networks. Information becomes more accessible and possibly more valuable when shared.

Bunda College
There is no coherent distribution system for academic, government or NGO publications in Malawi. For example, the Bunda College Aquaculture and Fisheries Department's technical report, *Aqua-Fish*, is distributed on demand rather than systematically. Another example is the uneven distribution of the proceedings of the 2001 Lake Malawi Fisheries Management Symposium (Weyl *et al.*, 2001). The Bunda Library had several reprints from the conference but not the complete proceedings. A search of the FAO Fisheries Library collection revealed a copy as the sponsor, the Deutsche Gesellschaft für Technische Zusammenarbeit, had sent the publication to FAO, but the appropriate library in Malawi had not received a copy.

IMROP
Institutional publications published by partners and donors can often be identified, but print or digital copies are not always forthcoming. L'Institut de recherche pour le développement provides a searchable database which includes francophone African research references with links to electronic full text when available (2004). Downloading large files can be problematic, and printing expensive.

NACA
Collecting information at NACA takes on a different dimension as the collection is digital. Once relevant information is identified, the issue revolves around ownership. Open access is integral to NACA's information philosophy. Yet, members may want to retain control of access to a given publication. NACA then must decide when to link to an existing relevant document versus storing a copy on NACA's server.

ICSF
ICSF also maintains a digital collection of documents produced by the organization or its partners. Maintaining a coherent organization and structure that accommodates users without straining staff resources demands constant attention. Development of local digital resources such as databases presents a technical challenge to enable partners in other parts of the world to share in the development and use of these resources.

Sustaining access to resources through networks

The term "networks" describes the wide variety of mechanisms fisheries libraries and information centres use to provide access to information. Often, electronic networks are seen as a panacea for information delivery and large financial investments have been made in them. More traditional networks such as regional collaboration, university systems, and professional societies also provide access to resources. All need time and effort to sustain them and the relative costs and benefits are not well analysed.

Bunda College
Access to scientific journals diminished during the 1990s as subscriptions declined from 200 in the 1980s to 31 in 2004 (Kadzamira, Ngwira and Salanje, 2004). Recently, this trend is reversing with electronic access to full-text journals via the FAO AGORA project and the INASP PERI project. Electronic resources are useless without adequate Internet bandwidth and speed. The Internet connection at Bunda College has recently improved to a 64 baud radio link. There are currently efforts to establish a VSAT connection to further stabilize connections throughout the country. These services require professionals to coordinate the services, monitor use and explore new options. Sustaining them requires financial and professional resources.

IMROP
As part of the ODINAFRICA project, the IMROP Library has access to technical expertise, equipment, and resources not available to all institutions in Mauritania. Being part of the network means being party to group decisions on software and hardware. Consequently, the Library is faced with maintaining multiple systems to satisfy internal needs and external requirements. It is migrating systems from CDS-ISIS to INMAGIC to meet ODINAFRICA requirements while implementing WWW-ASFA-ISIS as a new ASFA partner. The technical demands on staff increase. Participation in various professional networks also takes time and effort so the benefits must outweigh the input. Active involvement in the AFRIAMSLIC Regional Group of IAMSLIC means an ability to commit to projects such as the first regional conference of the group and production of the proceedings (IAMSLIC, 2003). Language differences pose an additional challenge.

NACA
NACA primarily relies on electronic networks to communicate with its 16 member countries and to deliver information to its broader audience. It is very aware of the variability in Internet capability of its partners. Different strategies for providing access emerge such as access through local radio and television as well as delivery of information in print and on CD. Professional linkages among librarians and information specialists pose more of a challenge as library networks are rare in the region and usually confined to agencies or universities. The lack of professional networking opportunities locally or regionally forces NACA staff to look further afield for expertise and advice.

ICSF
To maintain fast and reliable electronic access, ICSF uses an off-shore server (located in California) to store and serve its extensive collection of digital publications. This is a cost-effective solution for the time being. If costs increase or delivery time slows, then alternatives will be explored. The staff faces challenges common to all who are working with electronic information including how to ensure the long-term stability of formats and how to establish relevant electronic links with other organizations and dissemination services.

Maintaining staff capacity and expertise

Libraries and information centres require staff with both traditional information management expertise as well as technical skills. Managing digital collections, negotiating license agreements, and developing workable consortia demand expertise in technology, business and communication. At the same time, traditional expertise in cataloguing, indexing, instruction and reference remain critical to a successful library.

Bunda College
Bunda College Library supports a broad curriculum and research programme and does not have subject specialists on staff. Consequently, there is no person who consistently seeks out fisheries information as well as related socio-economic and cultural information. Given the expense of information resources such as journal subscriptions and current scientific monographs, funds need to be carefully allocated with knowledge of the subject and the users.

Rapid changes in library technology have challenged even experienced library staff to cope with constantly learning and applying of new techniques and methodologies. For example, the technical aspects of local network installation and maintenance of CD databases adds a burden to the already over-committed librarians. Projects such as digitizing local information or unique collections are more difficult in libraries which lack adequately trained staff.

HIV/AIDS has reduced the numbers of professionals in all sectors especially those in mid career. Consequently, the remaining staff often assumes leadership roles without adequate mentoring and takes on multiple assignments due to lack of appropriate staff. Younger staff members who may have the ability to become qualified librarians do not have access to the training opportunities available in the 1980s and early 1990s

IMROP
Once trained, retaining staff with technical expertise can be problematic. Often, the library invests in staff training only to have the staff member leave for a better paying position or one with more prestige. Expertise in multiple languages is also helpful, but often difficult to find. Currently, staff at IMROP is well qualified and new projects on digital publishing and institutional repositories may help to keep the excellent technical staff.

NACA
The NACA Information Centre operates with a small staff many of whom come with no background in information or web experience. Consequently, technical expertise of the local staff has to be developed locally. The implementation of a content management system allows the programme staff to handle more of the production (Wilkinson, Sim and Suansook. In press). Increasing the expertise of local staff and external partners appears to be a successful strategy in this digital information environment.

ICSF
Staff expertise is not a major problem at ICSF. In large part, this is due to commitment of a dynamic team. Also, the talent pool is very good if technical expertise is needed. Outsourcing of technical tasks to regular collaborators is routine. Lack of time to work on user interface feedback and multi-lingual issues are beginning to emerge. Again, the small staff must make decisions about where to prioritize time and effort.

Assisting target audiences with information

The complexity of fisheries information tests the searching and evaluation skills of users. Librarians have a responsibility to alert users about relevant resources and to assist them with searching effectively. The wealth of new resources available electronically heightens the importance of these skills. Libraries can help bring science and management together by providing access to the breadth of information and by training users to find information outside their often narrow disciplines. Enhancing the expertise of users with fisheries information is a matter of constant training and communication.

Bunda College
The faculty members and students at Bunda College are familiar with limited access to fisheries information. Consequently, they circumvent the library by requesting articles from authors and using personal collections.

The new electronic resources can be daunting to users as the interfaces vary, there is overlap between sources, and getting information is often a multi-step process. The library staff members are challenged to change the information habits of their users by encouraging them to learn new tools and methods for finding information.

IMROP
Administrators in many organizations use information differently than scientists and students. Convincing them of the need for resources to create and access electronic information is critical. Some unease has been expressed about digitizing local publications and making administrative and technical reports more accessible. Explaining the value of open access information to the institution and individuals is ongoing.

The scientists embrace the ease of access to electronic material, yet still need to be taught effective ways to search and retrieve material. The issue of language rears up again; major resources and finding tools are not available in French. For instance, ASFA does not have a French search interface, and the French thesaurus is still in beta testing. Consequently, the library staff must work with users to overcome the language barrier.

NACA
NACA does not have onsite users and must build its web site so that people can find relevant information easily. The challenge is in designing and refreshing the web site so it is usable, maintainable, and promotes return visits.

ICSF
The ICSF audience is worldwide and remote. So, helping users to find the necessary information revolves around populating the web site with relevant material, and presenting it in a logical and usable manner. Those users without internet access and with varying levels of literacy need more specialized assistance to obtain and use ICSF information. There is no information training programme for end users especially fishworkers; however, exchange and training programmes are a major activity of ICSF.

3.3 Opportunities for enhancing access to fisheries information

The case studies share the common goals of better access to local information, sustained access to information resources, and improved use of fisheries information. Opportunities and approaches vary given differences in the organizations and settings. The following examples illustrate the range of possibilities fisheries libraries are exploring and implementing

Better access to local information

Local information is the foundation for responsible fisheries management as management begins locally. The challenge of identifying and collecting local fisheries information becomes an opportunity to increase access to it, both locally and internationally. Increasing access to existing local information is as important as adding the new.

Bunda College
The Library is taking the lead to establish regular communication among the libraries involved with fisheries in Malawi, including an email list and periodic meetings. An IAMSLIC funded two day workshop in June 2004 brought together those responsible for fisheries libraries to discuss issues and joint projects. Such discussion can lead to the creation of relevant distribution lists as well as development of an understanding of the need to share information and expertise. Sustaining the discussion through email lists, annual collecting trips combined with training workshops and joint projects is important. One such project is the possible review of the SADC Inland Fisheries collection currently housed at the Malawi Department of Fisheries. This would involve analysing the contents of the SADC collection to ascertain its unique items and its value for adding to an existing fisheries collection or selectively digitizing.

IMROP
As a new ASFA partner, IMROP is improving access to local publications by adding them to the ASFA database. Mining the Horizon database produced by IRD may be useful to identify local publications that were never distributed or collected locally. Full text linkages to ASFA may be appropriate to explore.

NACA
Decentralizing digital publishing at NACA would have a lasting benefit at a small cost. Staff in the NACA centres would expand their expertise while making more publications accessible, including those in local languages. This effort requires adopting and implementing metadata standards, a requirement for sharing records with other organizations as well as maintaining searchabilty of NACA's digital publications.

NACA is also negotiating with the National Electronics and Computer Technology Centre of Thailand to provide the metadata as well as digital copies of NACA publications for its data warehouse. The project involves a significant back-indexing project for NACA to add standard metadata.

ICSF
Publicizing ICSF documents promotes their use. Consequently, ICSF is looking at various mechanisms to link publications to appropriate web sites and add them to e-journal lists. One product they are exploring is FullFreeText (2004) for better promotion of the Samudra Report. Such linkages can expand accessibility without high cost or significant staff time.

Improved use of fisheries information

Increasing training opportunities for both library staff and users is a shared strategy. Given differences in their users, each case study has different approaches to working with end-users. Better trained library staff increases institutional capacity as these people have stronger information management and teaching skills. Long-term strategies, such as ongoing funding for graduate library school students, are needed in addition to current opportunities (i.e. local training programmes).

Bunda College
The college setting provides an excellent opportunity to work directly with users to increase their familiarity with information resources. Targeting audiences such as the Aquaculture and Fisheries Department staff for training allows the library to focus on certain tools and resources. Increasing library staff expertise is an ongoing challenge given staff turnover and changes in the required skills. The Malawi Library Association provides a training programme that is useful and accessible, but needs revising to better address current conditions in Malawian libraries. Sharing training materials on electronic resources among MALICO members and others would spread the responsibility for developing such materials. Making the case for long-term investment in library staff is necessary.

IMROP
Focus on enhancing the skills of library staff members is evident at IMROP. The librarian is open to new ideas and different ways of improving use of information. Funding for involvement at the international level is actively pursued with good results. Such involvement increases the awareness of the institution's administration of the value of libraries and information while expanding the librarian's skills and knowledge.

NACA
Ease and speed of access are essential to improving the use of electronic documents. NACA relies on its web page to do this. A simple, yet effective, search tool is available and resources are grouped by subject. Subject-based discussion lists are also available so interested people can ask questions and exchange information. The use of log-files helps shape the web site as more heavily used materials suggest where to focus effort and development. This recognition of user input is commendable.

ICSF
As with NACA, ICSF improves use by maintaining a user-friendly web site available in English, French and Spanish. The electronic publications, many available in multiple languages, are organized by topic as well as title. Thought has been put into the organization of the site, so a user can manoeuvre through it without having to immediately resort to using the simple search interface. Paying attention to the principles of web site design has produced good results at ICSF.

Sustained access to information resources

Securing reliable funding for print resources and Internet access is one obvious strategy. The other primary one involves networking. From the sharing of expertise through training sessions to the sharing of information resources, networking is a major opportunity for sustained access. Sustaining implies a long-term commitment, and such longevity builds institutional capacity and staff expertise. It also creates a richer information resource for all. The following highlights some of the strategies for sustaining access:

Developing standard methodologies
The adoption and use of standard methodologies are critical to better access. Standardizing database record formats allows them to be more easily shared. Adhering to accepted standards promotes cross-catalogue searching. Migrating records from one system to another is simpler if records are well-structured according to standard methodologies rather than proprietary or institutionally based methods.

The standard methodologies make possible the creation of local digital collections. Awareness of possible formats and approaches to digitization and the subsequent organization of materials are critical to building usable digital collections. Experimentation with the Greenstone Digital Library software by librarians in Malawi could lead to country-wide collaboration as Greenstone is a standard (IFLA, 2002). The adoption of the Dublin Core metadata schema by NACA would enhance access to all NACA electronic publications.

Even traditional library tools improve when standard methodologies are considered. The ASFA indexing tools can be improved with the addition and refinement of local geographic, taxonomic and vernacular terms. For example, Malawi librarians could refine the geographic terms so relationships are drawn between Lake Malawi and Lake Nyassa. IMROP may have suggestions for vernacular names of indigenous species. Such enhancements enrich the tool for all users.

Improving access with technology
Internet access in fisheries libraries has improved immensely over the past decade. Yet, there are still inequities. Funding is an ongoing concern. Awareness of changing technology and new options can be as important as securing funding for access and improvement.

In some areas, reliable Internet access is not an option. Alternative technologies can improve access. Radio and television are not widely used by libraries, but are very effective in various countries and among diverse populations. New approaches present options for those without large bandwidth or with time constraints. The eJDS programme hosted at the Abdus Salam International Centre for Theroretical Physics is one example of innovation that could be widely adopted by those producing electronic fisheries journals as well as those using them in developing countries (International Center for Theoretical Physics, 2004). This service distributes electronic journal articles via email using a timely and simple approach. ICSF is exploring linking its journals into this system.

Building collaborations
Collaboration takes place at all levels, yet mostly starts locally. Some can be spontaneous while others need more structure. Promoting the exchange of locally produced bibliographic databases on fisheries via CD or PDF is a simple means of collaborating while expanding knowledge of local information. NACA does this regularly with its member countries and other interested parties. Contributing catalogue records to a central resource can save libraries time by sharing expertise while improving access for users. For instance, all four case studies could contribute their unique serial titles to the IAMSLIC Union List of Marine and Aquatic Serials.

Regional collaboration can improve local conditions. For example, Malawi fisheries libraries advocating as a group may lead to mechanisms for improved dissemination and distribution of documents among fisheries institutions. AFRIAMSLIC is proving to be a useful sounding board for sharing ideas and discovering new resources (IAMSLIC, 2003). It cuts across language barriers uniting professionals with common issues and challenges.

All four case studies see international collaboration as a mechanism for improving access to local fisheries information. ICSF uses such collaboration to increase its audience through

partnerships with like organizations in Chile, the Philippines, Taiwan, Senegal, Canada and France. IMROP and Bunda College benefit from participation in IAMSLIC, from the Distributed Library for resource sharing to small grants for workshops. NACA sees potential in collaborating with other colleagues as both a means of identifying expertise with digital publishing and of enhancing access to relevant material.

4. STRATEGIES FOR IMPROVING THE CAPTURE, DISSEMINATION, SHARING AND PRESERVATION OF FISHERIES INFORMATION

This Circular identifies the sources and complexity of fisheries information needed to support the implementation of the Code of Conduct for Responsible Fisheries. It provides a brief overview of some current practices for the capture, dissemination, sharing and preservation of fisheries information, in particular at the institutional level in developing countries. It also refers to some of the opportunities for improving the flow of information, as well as some of the many constraints. Now the challenge is to decide which strategies will best address the information related issues which have been identified by FAO Members as constraints to the effective implementation of the Code (FAO, 2001b; FAO, 2003b).

The strategies which have been proposed are aimed at achieving the following goals to overcome information-related constraints in the long term:

a) to strengthen institutional capacity for strategic information;
b) to identify and fill the gaps in fisheries information;
c) to improve the quality of scientific research that meets the needs of stakeholders;
d) to provide access to the necessary fishery management information.

The proposed strategies should increase the information capacity of fisheries institutions enabling them to take advantage of technological developments for accessing and disseminating information cost-effectively over the long term. Recognizing that fisheries management requires multidisciplinary information that includes a combination of science with other perspectives is essential when formulating strategies. Managing and disseminating locally and nationally produced information must be balanced with providing access to information across disciplines from global sources. Additionally, existing efforts on improving data and information on the status and trends of capture fisheries should be supported (FAO, 2003c).

The following strategies are those that have been suggested during preparation of this Circular rather than strategies endorsed by any organization. They have been elaborated by the authors on the basis of the surveys, case studies and reviews of the literature. The strategies are intended to assist libraries, their parent institutions and those supporting implementation of the Code to address information related constraints, especially in developing countries. Each strategy contains the following elements:

- the actions to be taken by fisheries libraries;
- the actions to be implemented by fisheries institutions in support of information services;
- the actions to be considered by external funding agencies and partners;
- the goal(s) addressed.

It is suggested that implementing these strategies will make a contribution towards improved information in support of implementation of the Code of Conduct for Responsible Fisheries. They will also assist in fulfilling the mission of libraries to sustain access to information resources and to improve the use of information.

Strategy 1. Provide and sustain access to the best available science

Actions by fisheries libraries

Libraries should seek to provide access to a wider fisheries information base. They should provide access to core journals via library consortia, via AGORA and other full-text scientific journals services. Libraries should incorporate full text, open access documents in local library systems. They should provide user training on information retrieval from new systems and outside narrow disciplines.

Actions by institutions

Institutions should upgrade library technology to facilitate access to global information resources. They should collaborate with other institutions and partners to improve Internet access.

Actions by external funding agencies and partners

Funding agencies and partners should provide assistance to assess the viability of sustained access to information. They should respond to the changes in electronic access and capability of partners.

Goal(s)

- to strengthen institutional capacity;
- to improve the quality of scientific research, and
- to provide access to the best fishery management information.

Strategy 2. Provide and sustain access to national fisheries research and development information

Actions by fisheries libraries

Libraries should systematically collect, provide access to and preserve local and national fisheries publications. They should participate in national networks to share information. They should update their knowledge base and take advantage of multidisciplinary information initiatives. Libraries should adopt national standards for local databases and international indexing standards. Libraries should adopt international metadata standards for the creation and dissemination of digital information.

Actions by institutions

Institutions should provide opportunities and support for the publication and dissemination of institutional research, including in peer-reviewed journals and conference proceedings.

Actions by external funding agencies and partners

Funding agencies and partners should support the publication of research and development findings by national institutions. They should ensure distribution and dissemination of information by projects carried out in collaboration with national institutions. They should deposit project reports and other project information generated by partnerships in appropriate local and national fisheries libraries.

Goal(s):

- to strengthen information resources and thereby institutional capacity;
- to fill the gaps in fisheries information both locally and nationally, and
- to improve access to local and national fisheries management information.

Strategy 3. Disseminate local and national fisheries research and development information

Actions by fisheries libraries

Libraries should raise the awareness of all stakeholders by means of bibliographies, contributions to newsletters and library services. They should provide publications to exchange partners nationally, regionally and internationally. They should ensure coverage of institutional publications in national repositories and databases. They should also ensure that local publications are covered by major fisheries databases and repositories. Libraries should link institutional digital publications to appropriate alerting services and harvesters.

Actions by institutions

Institutions should upgrade and support publication distribution and exchange programmes. They should create library pages on institutional web sites for improved dissemination. They should provide the infrastructure, or collaborate with other institutions, for repositories of digital publications.

Actions by external funding agencies and partners

Funding agencies and partners should support the creation of institutional and regional web pages and repositories of digital publications. They should support implementation of a harvester for existing appropriate institutional repositories. They should work to improve cross language harvesting of digital publications.

Goal(s):

- to integrate developing country fisheries information with that of the international aquatic community;
- to fill the gaps in fisheries information as national research is used, validated and preserved, and
- To strengthen the quality of national and regional scientific research.

Strategy 4. Strengthen expertise in fisheries libraries

Actions by fisheries libraries

Libraries should participate in and provide local training initiatives. They should develop and share specialized library expertise. They should update their knowledge of available technology for library and information management. In collaboration with IAMSLIC members, libraries should synthesize guidelines for the improved capture, preservation and dissemination of digital fisheries and aquaculture publications.

Actions by institutions

Institutions should support participation in training initiatives and in professional development.

Actions by external funding agencies and partners

Funding agencies and partners should support training initiatives and scholarships for advanced training in library science. They should support short-term and long-term projects that enhance access to information while building institutional capacity. They should support the synthesis of guidelines for the improved capture, preservation and dissemination of digital fisheries and aquaculture publications.

Goal(s):

- to strengthen institutional and information capacity, and
- to improve the dissemination and use of the best fisheries management information.

Strategy 5. Strengthen regional and international information resources sharing

Actions by fisheries libraries

Libraries should provide access to a wider fisheries information base. They should share information and expertise at regional and international level. They should adopt international standards and current methodologies for information management to enable information exchange.

Actions by institutions

Institutions should support network coordination and encourage active participation in networking activities. They should upgrade library technology, especially to facilitate electronic document transmission.

Actions by external funding agencies and partners

Funding agencies and partners should incorporate the cost of information resources and services in regional project and programme planning.

Goal(s):

- to strengthen regional and international collaboration in fisheries management;
- to strengthen institutional capacity through partnerships, and
- To provide access to the best fisheries management information.

Strategy 6. Provide the right information to the right user at the right time

Actions by fisheries libraries

Libraries should identify their target audiences and tailor library services to the needs of diverse users and stakeholders. They should develop and provide end-user training programmes.

Actions by institutions

Institutions should define target audiences for the information which they produce. They should adapt information services to reflect changes in fisheries governance, such as decentralization. They should develop outreach and awareness raising strategies. Institutions should provide appropriate information in the most appropriate format for all stakeholders.

Actions by external funding agencies and partners

Funding agencies and partners should support the introduction of information services for growing and more diverse user communities. They should support the translation of publications into appropriate languages, re-packaged and in a variety of formats and levels of complexity.

Goal(s):

- to disseminate general information about the Code and its goals to users and stakeholders;
- to provide access to specialized research and technical information, and
- to provide access to the best fisheries management information to all stakeholders, permitting them to make informed decisions about options and approaches for the implementation of the Code.

Strategy 7. Be cost-effective and long term

Actions by fisheries libraries

Libraries should evaluate services in terms of cost and benefits. They should review and tailor the collection to the mandate and mission of the institution. They should preserve and provide access to historic as well as current information.

Actions by institutions

Institutions should provide cost-effective and equitable access to information at institutional level. They should integrate the costs of information resources and services into organizational planning and funding.

Actions by external funding agencies and partners

Funding agencies and partners should evaluate the comparative costs of information systems and services in relation to long-term benefits for the institution and the national economy. They should integrate the costs of information resources and services into project planning and funding.

Goal(s):

- to strengthen and sustain institutional capacity;
- to identify and fill the gaps in fisheries information;
- to improve the quality of scientific research to meet the needs of stakeholders, and
- to provide access to the best fisheries management information.

ANNEX 1

CODE DOCUMENTS

Title	Series #	Date	Pages	Refs	OCLC holdings
Code of Conduct for Responsible Fisheries		1995	41	0	114
International Plans of Action					
International Plan of Action for reducing incidental catch of seabirds in longline fisheries		1999	10/26	2	58
International Plan of Action for the conservation and management of sharks		1999	8/26	2	58
International Plan of Action for the management of fishing		1999	8/26	1	58
International Plan of Action to prevent, deter and eliminate illegal, unreported and unregulated fishing		2001	24	0	49
Strategies					
Strategy for improving information on status and trends of capture fisheries		2003	34	0	37
FAO Technical Guidelines for Responsible Fisheries					
Fishing operations	1	1996	26	0	66
Fishing operations 1. Vessel monitoring systems	1.1	1998	58	0	41
Precautionary approach to capture fisheries and species introductions.	2	1996	54	0	58
Integration of fisheries into coastal area management	3	1996	17	0	65
Fisheries management	4	1997	82	0	59
Fisheries management 1. Conservation and management of sharks	4.1	2000	37	14	50
Fisheries management 2. The ecosystem approach to fisheries	4.2	2003	112	19	29
Aquaculture development	5	1997	40	127	66
Aquaculture development 1. Good aquaculture feed manufacturing practices	5.1	2001	47	97	70
Inland fisheries	6	1997	36	0	66
Responsible fish utilization	7	1998	33	13	49
Indicators for sustainable development of marine capture fisheries	8	1999	68	4	52
Implementation of the International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing	9	2002	122	34	48
Popular Code Publications					
Connecting the lines (video and included on CD)		2000	0	0	8
What is the Code of Conduct for Responsible Fisheries?		2001	13	0	56
Stopping illegal, unreported and unregulated fishing		2002	20	0	40
Inland fisheries		2003	14	0	33
FAO/FishCode Review					
Tuna and bottom fishery licence management: Tonga	1	2003	35	0	0
The marine fisheries of Cambodia	4	2004	57	52	0
Responsible fisheries management in large rivers and reservoirs of Latin America: Seminar report	5	2004	72	57	0
National plans to combat illegal, unreported and unregulated fishing: Models for coastal and small island developing states	6	2003	76	7	0

ANNEX 2

SURVEY ON THE INFORMATION USED AND PRODUCED BY THE FAO FISHERIES DEPARTMENT STAFF

A2.1 Production and dissemination of Code-related publications by Fisheries Department Staff

In April 2004, the staff of the Fisheries Department was surveyed on their use and creation of information supporting implementation of the Code. In this section, the responses concerning the number of, the audience and the dissemination methods for publications produced by the Department are summarized. Responses on the searching for and the use of information are summarized in section A2.2.

Methodology

Seventy FAO staff members were sent a web-based survey containing 21 questions. Given those on duty travel and otherwise unavailable to participate, the survey sample was reduced to 59. A prompt was sent 10 days after the initial contact. Thirty-four of the adjusted sample responded fully, i.e. response rate of 57.6 percent (Table 2.1). Responses were well distributed throughout the Department's four divisions (i.e. Information, Data and Statistics; Policy and Planning; Industries; Resources and Environment). Of those 34 responding, two indicated they did not work with the Code at all. Three only used Code information while two only produced it. Consequently, for most questions, the useful responses were 31 for the questions on using Code information and 30 for those on creating Code-related publications.

Table 2.1: Response rate to Fisheries Department survey

Survey Sample	Adjusted Survey Sample	Responses	Adjusted Response Rate
70	59	34	57.6%

Involvement with producing publications

Of the 34 staff members responding, 30 indicated that they produced publications related to the Code. Respondents interpreted this broadly as illustrated by this remark: "...I work with basic fisheries management". Others mentioned specific publications and a strong sense of their division's production being Code-related: "Most of [Fisheries Industries'] publications have a bearing on the Code, including contributions to *SOFIA* on fleets, fleet economics, trade, fish processing and small scale fisheries". Twenty-six of the thirty indicated how many publications they have produced over the period of their involvement with the Code. Ten or less was the most common response (Table 2.1).

There continues to be a strong commitment in the Fisheries Department to publishing in print (Table 2.2). All who publish in print also request PDF output suggesting the use of electronic delivery of their print publications. One person requests output in all the listed formats while six limit themselves to print only. Fifty four per cent publish in three or more formats. Nobody reported publishing on video or DVD.

Table 2.2: Production of Code-related publications as reported by survey respondents

Numbers of Publications	<5	5-10	11-15	16-20	>20
Number of Respondents	10	10	1	3	2

Format of publications	Print	HTML	Online database	XML	PDF	CD
Number of respondents	27	11	8	3	14	9

Subject areas addressed by publications of survey respondents:

Table 2.3 lists the subject areas that staff members consider that their publications address in descending order of importance. Fisheries management and policy and planning are the top publication subjects by far. The additional key subject areas of the Code are represented, including the ecosystem approach, integrated coastal management and the sociological aspects of fisheries.

An additional column compares the publications' subject areas to the subject areas staff members search for information. A more complete discussion of the searching patterns is given in Section 1.3. Of note here are two things. First, staff members search more broadly than they publish given the differences in response rates. Second, some subject areas appear important as sources of information, but not as publication topics.

Table 2.3: Subject areas of Code-related publications produced by FAO Fisheries Department

FAO Fisheries Divisions:
FIDI Fishery Information, Data and Statistics
FII Fishery Industries
FIP Fishery Policy and Planning
FIR Fishery Resources and Environment

	FAO Fisheries Division					
Subject areas	**FIDI**	**FII**	**FIP**	**FIR**	**Total responses**	**Total subject areas**
Fisheries management	2	3	7	6	**19**	21
Policy and planning	2	3	9	5	**18**	19
Ecosystem approach to fisheries	2	1	4	5	**12**	16
Social and anthropological aspects of fisheries	1	3	6	2	**12**	10
Aquaculture (includes fish, shellfish, and aquatic plants)	3	1	4	3	**11**	15
Law and legislation	2	3	5	1	**11**	15
Economics and marketing	1	3	7		**11**	14
Integrated coastal area management	2	2	4	2	**10**	13
Fishing gear and methods	2	3	1	1	**7**	7
Fishery statistics and sampling	2	1	1	4	**7**	7
Information access and dissemination	3	1	1	1	**6**	9
Stock assessment	1			5	**6**	6
Food quality	2	2	1		**5**	6
Commodity and trade statistics	1	2	1		**4**	5
Fisheries biology and habitat				3	**3**	3
Fisheries nomenclature	1	1		1	**3**	3
Food technology	1	2			**3**	3
Genetics	1			2	**3**	2
Effects of aquaculture on the environment	2				**2**	10
Aquatic products	1	1			**2**	5
Fishery oceanography and limnology				1	**1**	2
Fishery charts and mapping				1	**1**	1

Target audiences

The two questions addressed who the Fisheries Department staff perceives as the audience for their publications. Intended audience could affect format, dissemination method as well as content. All respondents but one identified developing countries as one of their primary audiences (Table 2.4). Only 19 percent thought that their audience was only located in developing countries. One third specified a broad audience in both developed and developing countries while another third added FAO to the mix. In general, the audience for FAO Code publications is distributed broadly throughout the world.

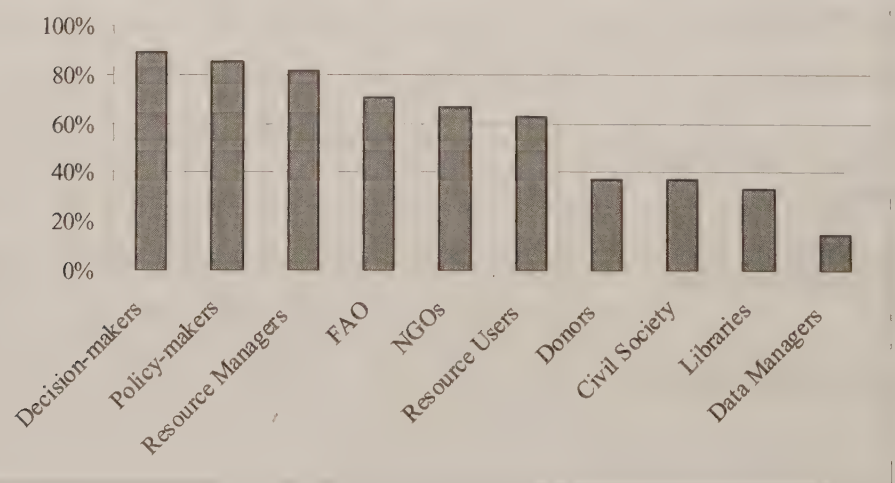
Table 2.4: Geographic location of primary audience

	Developing countries only	Developing and developed countries	Developing countries and FAO	Developed countries and FAO	All
Number of responses	5	9	3	1	9
Total	19%	33%	11%	4%	33%

This same trend towards a broad-based audience is reflected in the responses to the second question – who is your audience by type (Chart 2.1). Given the survey structure, it was not possible to do a correlation between geographic location and audience type.

- The largest audience are those involved in decision making at varying levels (89 percent for highest level or policy work and 85 percent for decisions at other levels).
- Resource managers are the second largest audience (81 percent).
- FAO staff and consultants along with non-governmental organizations are another significant audience (70 percent and 67 percent respectively).
- Sixty-three percent of the respondents identified resource users including the fishing industry and fishers as an audience.
- Donors and civil society are lesser audiences on the whole, but still a target of one third of the respondents.
- Librarians and information managers are a factor for another third.
- Only one respondent specified scientists as a target audience.

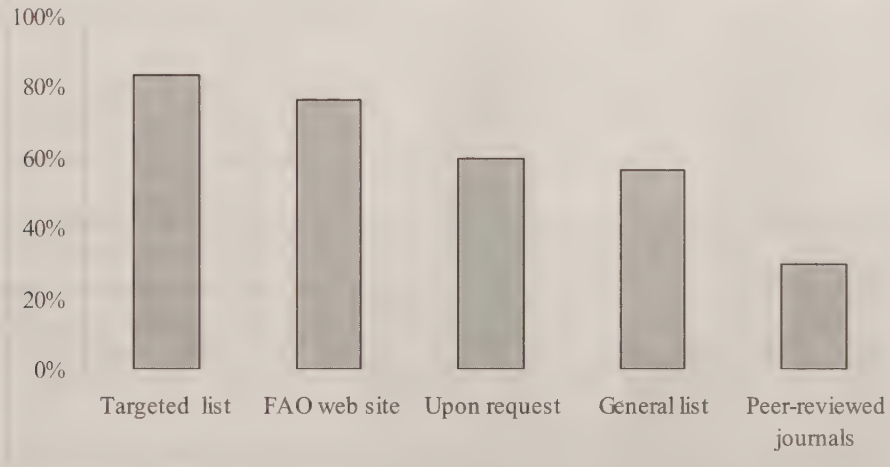
Chart 2.1: Audience for publications by percentage of respondents



Distribution of publications by survey respondents

The FAO Fisheries Department has a policy of providing its publications upon request as well as to established distribution lists. This policy has worked well for dissemination of the Code core documents as described in Part 1.2.2. Survey participants were asked what mechanisms they used for dissemination of their publications and they could check multiple methods (Chart 2.2). Multiple methods are used with targeted distribution lists being the most prevalent (83 percent). The FAO web site including the Fisheries Department home page is a critical dissemination mechanism (77 percent). The peer-reviewed literature features less prominently (30 percent). Six of the nine who publish in the peer-reviewed literature also use the other four dissemination mechanisms.

Chart 2.2: Distribution of publications by percentage of respondents



Over a third of the respondents use all or four of the five mechanisms (Table 2.5). Half use two or three. Those using two delivery mechanisms tend to respond to requests more often than other mechanisms. Three of the four respondents who only use one dissemination mechanism use a targeted list. The other concentrates on peer-reviewed literature.

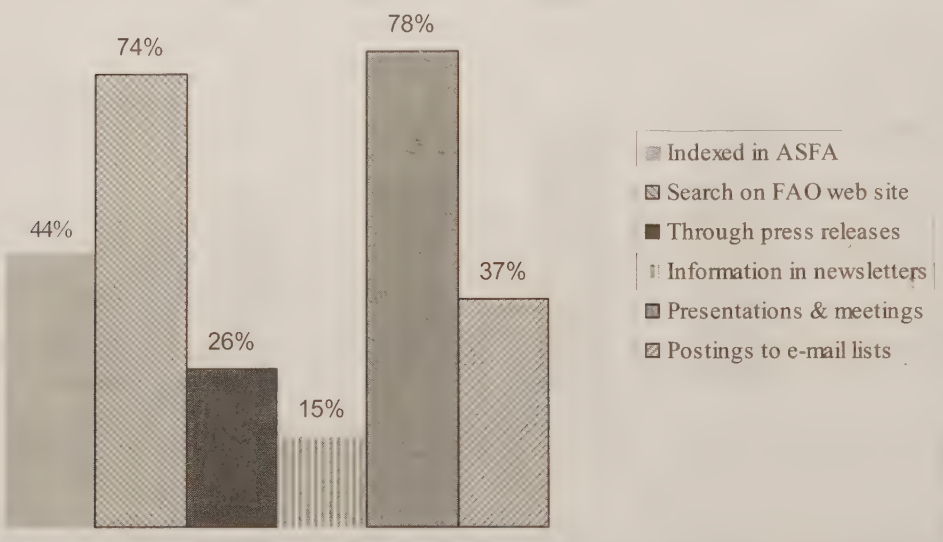
Table 2.5: Respondents use of multiple methods of dissemination

	Number of respondents
Using all	6
Using 4 methods	5
Using 3 methods	8
Using 2 methods	7
Using 1 method	4
Total responding	**30**

How do the targeted audiences find publications produced by survey respondents?

Respondents consider face to face meetings, consultations and conference presentations the most common means for their audiences to find out about their Code-related publications. Again, the FAO web site is a discovery mechanism. One respondent specifically mentioned Google while another considers searches on the Fisheries Global Information System (FIGIS) and the *UN Atlas of the Oceans* as tools for finding publications. Forty-four percent consider ASFA as a finding tool. Postings to email discussion lists are also thought to be useful. Information in newsletters and press releases are less frequently cited.

Chart 2.3: Finding publications produced by respondents



Fifty-nine percent of the respondents checked two or three ways by which audiences find publications. Twenty-two percent checked more than three and nineteen percent mentioned only one. Those identifying ASFA tended to mention three or more ways to find publications. Otherwise, there was no apparent pattern of overlapping discovery methods.

Archiving FAO Code-related publications

The Fisheries Department is "mandated to compile, analyse and disseminate fishery data and information" (FAO, 2004a). While not explicitly mentioned in the Department's mandate, FAO does have a policy and a process for archiving FAO publications, and the institutional memory of FAO is the responsibility of the General Affairs and Information Department. Consequently, survey participants were asked how the publications they produced were archived. There was general recognition of the need for archiving both print and electronic publications. The twenty one responses indicate a variety of awareness of the procedures.

- the FAO Library
- the FAO Corporate Document Repository.
- the FAO Fisheries Department PDF document repository
- publishers
- CDs
- personal computer
- personal print collection

A2.2 What subject information is used by FAO Fisheries Department staff?

Identifying the material that Fisheries Department staff members use to produce Code publications helps to understand the information potentially needed by others. This part summarizes the section of the Fisheries Department survey which addresses how the staff members search for information. Participants were asked about patterns of usage, tools and resources used as well as specific tasks done. Respondents also identified subject areas of primary interest.

Time spent and subjects searched

More than half of the respondents search for Code-related information on a regular basis, that is, at least weekly. Less than a quarter seldom look for Code-related information. The subject areas are listed by frequency of use in Table 2.6. The highest ranking subject areas searched are "Fisheries Management" along with "Policy and Planning". The number of divisions within the Fisheries Department which search the subject area is also listed as this gives an indication of the complexity and breadth of Code-related work. For example, someone whose primary focus is on aquaculture finds themselves searching for policy, management and ecosystem information in addition to aquaculture material. An economist looks for fisheries management and policy information as well as commodity and trade statistics. In general, those at FAO actively involved with the implementation of the Code look for various types of information across a broad range of subject areas.

The staff members were asked to give examples of search terms they use for Code-related information as well as specific tasks they had recently executed. The responses give insight into the subject areas people are working on and how they go about doing the information gathering component of their work. Identifying and addressing the tasks can help shape how information systems or portals to resources are designed (Lewis and Rieman, 1994). Table 2.7 gives examples of some of these tasks along with the terms used. The tasks fall into four categories:

- **Searching for specific publications:**
  Many of the specific publications mentioned are FAO publications that are electronically available through the Fisheries Department web page or another FAO source.

- **Searching for statistics:**
  Many respondents look for statistics, and most of those use the FAO Fisheries FISHSTAT resource.

- **Searching for information on specific subjects or concepts:**
  The variety of subjects and concepts illustrates the breadth of information needed to effectively work with the Code and implementation of responsible fisheries and aquaculture management. Many of the concepts need a complex search strategy over multiple resources to be successful.

- **Reviewing, discussing and working with information:**
  Reading, reviewing and discussing are important steps in synthesizing information into publications.

Table 2.6: Subject areas searched by survey respondents when doing Code-related work

Subject Areas	FAO Division					Total responses	No. of Divisions responding
	FIDI	FII	FIP	FIR	Other FAO		
Fisheries management	3	3	8	6	1	**21**	5
Policy and planning	3	1	10	4	1	**19**	5
Ecosystem approach to fisheries	4	1	5	5	1	**16**	5
Aquaculture (includes fish, shellfish, and aquatic plants)	2	1	7	4	1	**15**	5
Law and legislation	3	2	8	1	1	**15**	5
Economics and marketing	3	3	8			**14**	3
Integrated coastal area management	1	2	7	2	1	**13**	5
Effects of aquaculture on the environment	2	1	5	2		**10**	4
Social and anthropological aspects of fisheries	1	1	6	2		**10**	4
Information access and dissemination	4		3	1	1	**9**	4
Fishing gear and methods	1	2	1	2	1	**7**	5
Fishery statistics and sampling	2	1	1	3		**7**	3
Food quality	2	2	1		1	**6**	4
Stock assessment			1	5		**6**	2
Aquatic products	2	1	1		1	**5**	4
Commodity and trade statistics	1	1	3			**5**	3
Fisheries biology and habitat		1		2		**3**	2
Fisheries nomenclature	1	1			1	**3**	3
Food technology	2		1			**3**	2
Fishery oceanography and limnology				2		**2**	1
Genetics				2		**2**	1
Fishery charts and mapping	1					**1**	1

Table 2.7: Selected Code-related information tasks done by survey respondents

Searched for publications	Searched for statistics
4th International Fisheries Observers Conf.	Aquaculture statistics by country & by species
Codes of good practices in aquaculture	Country statistics in the FAO FISHSTAT
Codex Alimentarius reports	Fish production in FISHSTAT
French version of the Code	FISHSTAT software for aquaculture production
National country profiles	Inland fisheries statistics in FISHSTAT
Reports to COFI on Code implementation	Numbers of fishers
Socio-economics manual	Statistics on Moroccan fisheries
SOFIA 2002	Trade statistics in FISHSTAT
Searched for specific subjects or concepts	**Reviewed, used and discussed**
Applications to socio-economic systems	Code related activities vs. FAO Strategic Framework
Conservation vs. allocation information	Contacted government officials directly
Cost and earnings	Did field work under Technical Cooperation Project (TCP)
Ecologically sustainable development	Distributed brochure on exotic species
Fish nomenclature	Included Codex definitions in Aquaculture Glossary
Fishing licensing systems	Read the Code of Conduct
Fishing techniques	Related GAP with the Code
Future of fisheries forecasts	Reviewed fisheries agreements
Information flow between researchers and end users	Reviewed IPOA capacity
Management action in restoring depleted fish stock	Reviewed of fishery country profiles
Models of living systems	Studied what the Code says about value addition
Social and economic dimensions of sustainability	Studied fish trade and food security
Suppliers of vessel refrigeration equipment	Talked to colleagues on project ideas

The search terms and phrases used appear to cluster under three main subject areas: policy and planning, fisheries management, and economics and marketing (Table 2.8). Again, the breadth of terms used is wide. There is a range of specificity as well. For instance, a staff member looking for fisheries management information may need something as specific as a diagram of a particular gear type in a certain fishery, or as general as "management objectives" if beginning a project on Code implementation. Aquaculture is mentioned as a search term several times, but more specific terms were not listed by respondents.

Missing from both the task list and the search terms are scientific items. Some general terms such as ecosystem and genetics appear. However, given the context of the survey, these appear to be used in conjunction with management concepts such as mixed-stocks or introduced species. This observation reinforces the point that when looking for Code-related information, respondents focus on management and policy concepts with some overlap into pure science.

Table 2.8: Examples of search terms and phrases used by survey respondents

closed area	livelihoods
code of practice	management objectives
compliance agreement	Marketing and trade
culture-based fisheries	monitoring
developing countries	national strategies for Code implementation
economic and social dimension	participatory approach
ecosystem	post-harvest treatment
enforcement	poverty alleviation
extended economic zones	precautionary approach
fisheries assessment	refrigeration
fishing capacity	regional fishery bodies and arrangement
fishing gears	responsible aquaculture
flag state	safety at sea
food security	self-organizing processes
gear	small- scale fisheries/artisanal fisheries
genetics	stakeholder participation
governance	sustainability
integrated area development	value addition
IUU fishing	vessel
legal framework	workers

Information retrieval tools used

Thirty-one respondents answered the question on usage of specific tools, yet all did not answer for each option. A missing response was considered a non-use of the tool. The tools selected for the question represent a range from the general (e.g. searching the Internet with Google or another search engine) to subject specific (e.g. FishBase) to full-text databases (e.g. FIGIS.) Some of the tools are produced within the Fisheries Department. Others are only available within the FAO Headquarters due to licensing agreements.

The results (Table 2.9) show that relatively few tools appear to be widely and regularly used. The Internet with a search engine has the widest regular use with almost 61 percent of respondents using it at least weekly to locate Code-related information. The high use is not surprising given the ubiquity of the Internet and the breadth of resources accessed through it. This pattern of use is reinforced by the 46 percent who indicate using the FAO Web site regularly. More surprising is the 39 percent of respondents who never or seldom use the Internet for Code-related information. A higher percentage does not use the FAO Web site. Listing both as tools was an attempt to see if there was a pattern of using the Internet with a search engine rather than the more specific and limited FAO Web site. The response may reflect confusion over the difference between the Internet and the FAO Web site rather than a preference. The non-use of either suggests that some respondents do not use the Internet regularly, or do not use it for Code-related information.

Thirty-nine per cent of respondents use the FAO Fisheries Library on a weekly basis. None indicate daily usage, but the periodic use by many indicates the value of the physical resource within the Department. One respondent particularly mentions the electronic tables of contents circulated from the Library as a regularly used resource. Several also mentioned the importance of print copies of documents, including the Code, as important for their daily work.

ASFA is the only subject specific bibliographic tool to be used by a core group of respondents (23 percent) on a regular basis. The ABAFR database is also available, but staff is less familiar with it. ASFA is a familiar tool to many and the ASFA Secretariat is housed in the Fisheries Department. The majority of users, 78 percent, never or seldom use ASFA for Code-related work. Explanations for the non-use of ASFA may include lack of familiarity by some individuals, perception that it is science or academically oriented, inconsistent linkages to full-text, uneven coverage of policy and socio-economic topics, and timeliness.

Table 2.9: Retrieval tools used by survey respondents to find Code-related information

	Daily		Weekly		Seldom		Never	
General tools	#	%	#	%	#	%	#	%
The Internet w/search engine	8	26	11	35	4	13	8	26
FAO Web site	7	23	7	23	8	26	9	29
A colleague	2	6	10	32	1	3	18	58
FAO Fisheries Library	0	0	12	39	10	32	9	29
FAO David Lubin Library	0	0	3	10	15	48	13	42
Subject indices								
ASFA	0	0	7	23	8	26	16	52
CABI	0	0	0	0	2	6	29	94
FAOLEX	1	3	0	0	8	26	22	71
FishBase	1	3	1	3	11	35	18	58
Full text resources								
FIGIS	3	10	4	13	6	19	18	58
Globefish	2	6	1	3	9	29	19	61
OneFish	0	0	0	0	9	29	22	71
WAICENT Information Finder	0	0	8	26	7	23	16	52

The relative lack of usage of specialized indices, databases and portals merits some attention given the time, effort and funds expended to create some of them. Internal users (e.g. the Fisheries Department) may perceive these resources differently than those outside of FAO. Being familiar with the information landscape in their niche of Code-related work, many appear to have developed personal methods of finding the information needed for Code-related work as well as preferences for particular tools. Many indicate talking to a colleague regularly, for instance. Others listed a variety of websites and resources they access regularly. These include specific reference materials such as the *Codex Alimentarius*, the websites and resources of other U.N. agencies such as the U.N. Department of the Law of the Sea, and the websites of other national, international and non-governmental organizations.

The patterns of usage of the information retrieval tools suggest that people use what is familiar and what works for them. No single tool completely satisfies the needs of those searching for Code-related information. People need to use multiple tools and resources, and do not rely on one source, hence, the high use of the Internet and Google (or its equivalent). Respondents may not use a tool because it is not easy (e.g. user-friendly interface) or convenient to use (e.g. connection speed). To validate this, users would need to be interviewed about their reactions to interfaces and content or observed while searching. Finally, as alluded to above, internal users may use tools differently than those outside of FAO Headquarters. External audiences may use these tools differently.

Code-related information that is difficult to find

A final question on finding Code-related information asked participants about information that was difficult or impossible to find. The purpose was twofold:

- gauge if users were frustrated locating Code-related information,
- identify any information gaps that may be appropriate for the Fisheries Department to address.

There is some frustration and eleven respondents specified difficult or impossible to find information. There was a range of frustration level with some saying "no problems" while others thought that "much" was hard to find. Looking at specific problems, the information needed is difficult to locate usually because it is scattered, supplied by agencies or institutions unfamiliar to the user, not well-synthesized or not adequately compiled. The following are typical examples given by participants.

- individual country efforts including compliance documents and current legislation:
  This tends to be scattered, unavailable electronically, and if available, not readily available within governmental websites.

- cost-benefit analysis of Code implementation:
  This represents the need to synthesize information that is difficult to find (e.g. comparing targeted aquaculture production to Code compliance.)

- foreign investment data:
  Economic information is often proprietary so difficult to access freely.

- statistics on the fishers including numbers, gender and fatalities:
  This is in part a compilation problem, but is also data that is not consistently collected.

- training initiatives and related material:
  This may be hard to find as there is little available electronically and no central collection point.

ANNEX 3

CODE-RELATED INFORMATION USED AND PRODUCED BY SELECTED FISHERIES EXPERTS

A3.1 Background

A small group of fisheries experts outside of FAO were surveyed to provide validation of results from the FAO Fisheries Department staff survey. A similar survey instrument was used with the addition of several questions on the use of specific journals and grey literature. Ten experts were selected on the basis of their geographic location, their institutional base and their level of involvement with fisheries science and management. Six responded completely including five from academic institutions and one from an intergovernmental organization. Their geographic locations are North America, Europe and Asia. All are familiar with the Code.

A3.2 Time spent, subjects searched and information retrieval tools used

Their searching behaviour was similar to that of FAO Fisheries Department staff. Four of the six searched for information on a regular basis, that is, at least weekly. The subject areas searched by at least four of the respondents include:

- policy and planning
- law and legislation
- economics, marketing and trade

Three respondents frequently searched on the ecosystem approach to fisheries and social aspects of fisheries. Fisheries science was not a term used in management or policy work by the respondents.

The search terms used were very similar to those of the Fisheries Department as was the usage of retrieval tools (Table 3.1). The only real difference is that the experts appear to rely on their institutional libraries slightly more. The experts also report using websites of specific organizations, academic institutions and government. Use of a personal collection of books was mentioned by one as an important information tool.

Table 3.1: Retrieval tools used by selected experts to find Code-related information

	Daily	Weekly	Seldom	Never
General tools	#	#	#	#
The Internet w/search engine	3	2	1	0
FAO Web site	0	3	3	0
A colleague	0	2	2	2
Institutional library	2	3	1	0
Subject indices				
ASFA	0	1	3	2
Legal database	1	0	2	3
FishBase	0	1	2	3
OneFish	0	0	1	5

A3.3 Code-related information that is difficult or impossible to find

Several of the experts gave examples of hard to find information and these were similar to those identified by the Fisheries Department. One area of agreement was information on individual country implementation of international agreements as well as infringements on agreements. The other area dealt with statistics. Here the examples are the amount of IUU fishing in the world and accurate aquaculture production statistics from China.

A3.4 Use of information sources

The experts were asked about their reading and information use patterns, questions not asked of the FAO Fisheries Department. Their responses show a reliance on local or subject specific information and regular use of a wide variety of grey literature. These findings are consistent with the later citation studies, the survey and interviews with FAO staff. Two examples of the types of journals or trade magazines read regularly by the experts illustrate the focus on a locale or a sector.

- journals read by expert 1
  - World Aquaculture Society journals
  - North American journal of aquaculture
  - Aquaculture research
  - Journal of applied aquaculture
  - World aquaculture
- journals read by expert 2
  - National fisherman
  - Pacific fishing
  - The economist
  - Marine resource economics

The experts also reported using grey literature from a variety of sources regularly or occasionally (Table 3.2). Only one reported non-use of the grey literature produced by the academic community.

Table 3.2: Experts' use of grey literature from the listed sources

Source of grey literature	# using regularly	# using occasionally	# using seldom	# never using
Governmental	4	2	0	0
Non-governmental	1	3	2	0
International Organizations	4	2	0	0
Trade and Industry	2	3	1	0
Academic	4	1	0	1

A3.5 Producing and disseminating publications

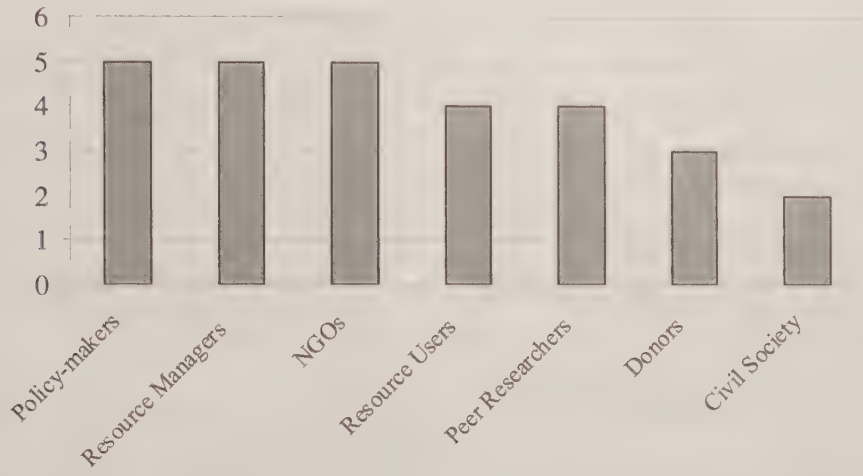
Five of the experts produce a variety of publications that support implementation of responsible fisheries management and policy.

- five publish institutional reports.
- three publish in peer-review journals.
- two publish books.
- one writes government reports.
- one publishes in trade outlets.

Their audience is very similar to that of the FAO Fisheries Department (Chart 3.1). Both groups target several groups with a focus on policy-makers and resource managers. The experts rank non-

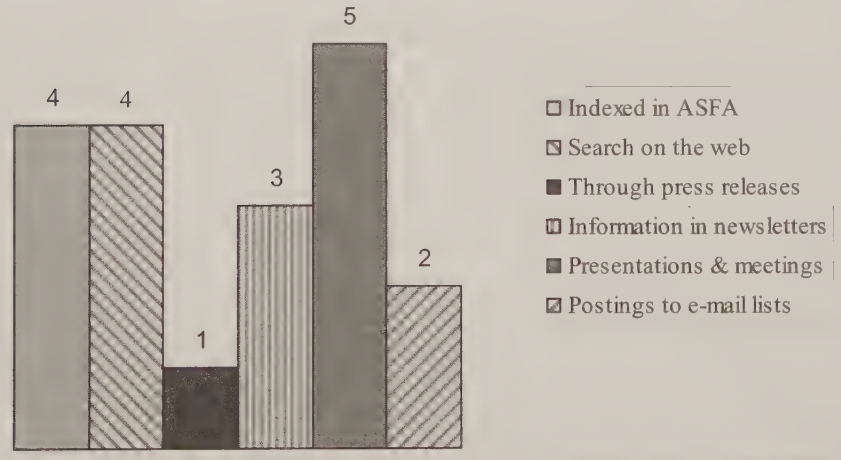
governmental organizations as an audience more prominently than does the FAO Fisheries Department.

Chart 3.1: Audience for publications of the selected experts



All the experts rely on presentations and meeting to communicate their work. This is similar to the FAO Fisheries staff and underscores the importance of workshops and conferences. They also see ASFA and the web as means of for their various audiences to find their publications.

Chart 3.2: Finding publications of the selected experts



The experts were asked where they published on responsible fisheries. It is interesting to compare this list to the list of journals they read regularly (Table 3.3). Titles in bold appear on both lists. The lack of significant overlap between the two lists reinforces the premise that the information needed for responsible fisheries is very broad.

Table 3.3: Where experts publish and what they read

Journals where experts publish	Journals that experts read regularly
Aquacultural Engineering	**Aquaculture Research**
Aquaculture Research	Fishing News International
Coastal Management	Forum Fisheries Agency Tuna Bulletin
Development and Change	J of Applied Aquaculture
Ecological Applications	**J of the World Aquaculture Society**
Ecological Economics	**Marine Policy**
Ecologist	Marine Resource Economics
Economic and Political Weekly	National Fisherman
Environmental and Development Economics	**North American J of Aquaculture**
Fish for the People (SEAFDEC)	Ocean and Coastal Management
Human Organization	Pacific Fishing
J of the Environment and Development	Samudra
J of the World Aquaculture Society	South Pacific Commission Newsletter
Land Economics	The Economist
Marine Policy	World Aquaculture
North American J of Aquaculture	WorldFish Report
Reviews in Fisheries Science	

The experts were also asked to comment on the utility of various journals as conduits for fisheries policy and management information and discussion (Table 3.4). *Marine Policy* and *Ocean Development and International Law* received the most rankings (i.e. 3) as important. *Fish and Fisheries*, *Lake and Reservoirs* and *Reviews in Fish Biology and Fisheries* were ranked the lowest in importance (i.e. 5).

The rankings must be considered with reserve given the small number of experts queried and their breadth of subjects. For example, an aquaculture specialist will rank his specialized journal higher than a fisheries economist would. *Lakes and Reservoirs* was ranked low because none of those queried are freshwater fisheries specialists. Even with the small sample size, it is striking that some of the journals do not receive high rankings from the experts given that other sectors consider them important conduits or they contain articles citing the Code. These include *Fisheries Research*, *Fisheries Management and Ecology*, *ICES Journal of Marine Science* and *Reviews in Fish Biology and Fisheries*.

Table 3.4: Experts' ranking of selected fisheries management journals

Fisheries Management Journals	# ranking as important	# ranking as often or occasionally useful	# ranking as not important
Aquaculture Econ. and Management		2	4
Aquaculture International		2	4
Can. J of Fish. and Aquatic Science	1	2	3
Coastal Management	1	3	2
Fish and Fisheries		1	5
Fisheries Management and Ecology		2	4
Fisheries Research		2	4
ICES J. of Marine Science		2	4
Intl J. of Marine and Coastal Law	2	2	2
Lakes and Reservoirs		1	5
Marine Policy	3	2	1
NAGA, WorldFish Quarterly		4	2
N. Amer. J of Fish. Management	1	2	3
Ocean and Coastal Management	1	4	1
Ocean Development and Intl. Law	3	2	1
Rev. in Fish Biology and Fisheries		1	5

ANNEX 4

INFORMATION USED TO PRODUCE PUBLICATIONS RELEVANT TO THE CODE

A4.1 Background

It is not easy to assess what information is needed to support implementation of the Code and responsible fisheries management in general. Investigating what different audiences use to produce relevant publications is one strategy. Typically, this is done through citation studies that show what is cited within a publication as well as what cites that publication. The Institute of Scientific Information's *Web of Science,* the major tool for doing traditional citation analysis, does not work well with fisheries policy and management documents for two primary reasons. First, policy guidelines, management plans and industry sector strategies are often drafted in formats that preclude formal references or citations. For example, both the United States and the Canadian implementation plans of the Code acknowledge the FAO Code, but do not include formal references (United States National Marine Fisheries Service, 1997; Canadian Department of Fisheries and Oceans, 1998). Second, those publications that might have citations are often not covered by the *Web of Science*. These include many journals published elsewhere than North America and Europe, more popular fisheries publications and grey literature.[16] This makes it more challenging to monitor how well the Code core documents are being used. Others have articulated similar frustration with tracking information usage of grey literature and information used to create grey literature (Rama and Takalkar, 2000).

Consequently, several approaches were used to investigate what types of information are used to produce the Code core documents and other responsible fisheries publications. The *Web of Science* from 1995 to the present was searched both by cited reference and general keyword for mention of the Code core documents. We examined the Code core documents as well as the FishCode Review series to discover what information resources were used in their creation. Selected national documents pertaining to the Code were examined for citations of the Code and the Technical Guidelines as well as to identify general types of information used to produce them. Selected publications of intergovernmental and regional organizations provided insight into the types of information used by those with varying levels of access to information. Finally, the articles or chapters in three recent edited compilations were reviewed for references.

The results have been organized by the sector producing the publications. These divisions are not precise as there is overlap between audience and producers. However, it helps sort out the information landscape of fisheries policy and management if we keep in mind the perspective of the producers and the readers. It also reinforces the challenge of assessing the types of information needed.

A4.2 Information produced by the academic and research community

Web of Science citation analysis: Citations to the Code core documents

The citation analysis using the *Web of Science* gives an idea of how the Code core documents are used by the academic audience of scientists and social scientists. This has an inherent bias towards commercial publications because much grey literature and many non-northern journals are not monitored regularly by the *Web of Science*. An additional complication is the nature of the Code as a document. The Code is not a treaty or an international agreement among governments. Rather, it is a non-binding instrument that was formally adopted by an intergovernmental organization. Consequently, its citation format is less well defined than for treaties and formal agreements making it

[16] Grey literature usually refers to the publications produced by all levels of governments, organizations, academics, business and industry in print and digital formats, but whose publication and dissemination are not controlled by commercial publishers, and where publishing is not the primary business activity of the entity (The Third International Conference on Grey Literature 1998; Gelfand 2000). Examples include technical reports, official documents, and industry guidelines. Many conference proceedings are also grey, especially those that are unedited or published by a non-commercial organization

harder to track using the *Web of Science* index (A. Coffman, personal communication, 2004). Even so, this citation analysis helps describe one type of usage of the Code core documents and suggests commercial journals of importance to Code-related work.

Various citation searches of the *Web of Science* from 1995 to spring 2004 revealed 107 documents that cited 11 Code documents with 126 citations to those documents. One additional document was identified with general keyword searching on the Code but had no citations. These numbers indicate good usage of the Code core documents compared to a similar study of GESAMP publications that found 114 GESAMP publications cited in 1178 papers with 1436 citations (Cordes, 2002). The citation rate also compares well with *SOFIA,* a publication that perhaps more visibility in the academic and research community.[17]

Table 4.1 illustrates which Code documents are cited and how they share citations, i.e. which ones may relate to each other in the user's context. The *Code* is obviously the most heavily used. *Technical Guideline 2* on the precautionary approach to capture fisheries is the next most cited followed by the 1999 IPOAs. These three IPOAs on seabird by catch, shark fisheries management, and fishing capacity were published in print as a single document making it difficult to ascertain which IPOA is cited; they now appear as separate documents on the FAO Fisheries Department web site. The *Technical Guideline 5* on aquaculture also receives attention. It is not surprising that *Strategy-STF* (2003) and *Technical Guidelines 4.2* and *9* (2003 and 2002 respectively) have no citations given their recent publication dates. However, it should be noted that the Technical Guidelines for fishing operations and fish utilization do not appear to have penetrated the mainstream literature. It is possible that they are used and just not cited in the scientific or management literature.

There is not extensive cross-citation. *Technical Guidelines 2*, *4* and *5* are more likely to be cross cited with the Code than the other *Technical Guidelines*. *Technical Guideline 2* and *4* may share an interest group although the data are sparse. This would be a logical connection between the precautionary approach and fisheries management. Other patterns are not apparent. The guidelines may be used by discrete groups within the scientific community.

[17] A cited reference search for *SOFIA* in the *Web of Science* is somewhat problematic as the title can be abbreviated in several ways and easily confused with other FAO statistical publications. Also, the year of publication is inconsistently cited by authors who often confuse the data in the title with the actual data of publication. Given these constraints, 107 citation were identified to the 1996, 1998 and 2000 editions of SOFIA (publication dates of 1997, 1999, and 2001.)

Table 4.1 Citation frequency of Code core documents in academic and research published literature

	Times cited	# of times co-cited with:								
		Code	TG 2	TG 3	TG 4	TG 5	TG 5.1	TG 6	TG 8	IPOAs
Code of Conduct	70		5	1	3	5				
Technical Guidelines										
1	0									
1.1	0									
2	16	5			3			1	1	
3	1	1	1		1					
4	7	3	3	1						
4.1	1									
4.2	0									
5	13	5					1			
5.1	1					1				
6	1		1							
7	0									
8	4		1							
9	0									
IPOA on seabirds, sharks, capacity	9									2
IPOA on IUU	3									2

***Web of Science* citation analysis: Types of publications citing the Code core documents**

Table 4.2 compares the major journals in fisheries and aquaculture management and science to those journals with two or more articles with citations to the Code core documents. The first column lists the 22 journals identified in the citation search in ISI's Web of Science with the number of articles citing Code documents in parentheses. The second column lists the 15 highest impact fisheries journals according to ISI's 2003 Journal Citation Report (ISI, 2003). The 21 journal titles in column three are indicative of those frequently used or requested by African fishery scientists (Ibeun, 2001; FAO, 2004d p.5; Kadzamira, Ngwira and Salanje, 2004). *Aquaculture*, *Aquaculture Research*, *Canadian Journal of Fisheries and Aquatic Sciences, Freshwater Biology* and *Journal of Fish Biology* were the most commonly mentioned titles among these sources. The African list has a slight bias towards more applied fisheries titles while the 2003 ISI list unusually includes several fish disease titles.[18] Using the African lists adds the perspective of fisheries scientists in developing countries, something the ISI list neglects.

The fourth column of 15 fisheries management journal titles was more problematic to compile as many fisheries journals claim to cover policy and management in addition to science. In reality, a journal usually has a primary focus and often that is on science. For this list, the expertise of the authors and colleagues in other fisheries and marine science libraries was used. It was validated by checking the journals used by heavily cited articles in fisheries policy and management as well as the publication conduits described by our selected fisheries experts.[19]

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[18] The ISI list is published annually. The appearance of fish disease journals on the list is a departure from past years and may be an aberration rather than truly reflecting enduring high use .

[19] See Part 1.3.4 for a description of the brief survey of fisheries experts outside of the FAO Fisheries Department.

The Code core documents have been cited in a range of journals, and as expected most articles appear in titles with a management focus or element. Ten of the management journals have articles citing the Code while only six of the ISI science journals have such articles. If the number of articles citing the Code is considered, more appear in management journals (51 compared to 33 in science journals). These observations suggest that the Code core documents are being discussed and integrated into the mainstream of fisheries and aquaculture management journals. Their presence among fisheries scientists is perhaps less established. This may be important to implementation of the Code of Conduct; a broad understanding of responsible fisheries is needed by both scientists and managers.

Comparing the lists vividly illustrates several challenges in providing information to support Code implementation. First, the split between science and management journals may seem arbitrary as many journals espouse to cover both. Yet, comparing List 2 and 4 reveals little overlap; they only share five titles, *Canadian Journal of Fisheries and Aquatic Sciences*, *ICES Journal of Marine Science, Fisheries Research, Reviews in Fish Biology and Fisheries* and *Transactions of the American Fisheries Society*. The first challenge is identifying what are the most effective outlets for Code information, and then making a decision about which to collect.

A related challenge is tracking fisheries-related journals. As more information is published on fisheries and aquaculture science and management, the number of fisheries-related journals increases as well. Major new journals continue to appear such as *Reviews in Fish Biology and Fisheries* (1990), *Fisheries Oceanography* (1992) and *Fish and Fisheries* (2000). These are addition to numerous regional publications. OCLC lists over 300 titles of serial fisheries publications produced since 1995. Five of the fifteen titles on the ISI list began publication in the 1990s. Lack of familiarity with appropriate outlets may limit publishing opportunities as well as limit exposure to new information. This can be especially acute in developing countries. List 3 only shares four titles with the List 2 and three titles with List 4 suggesting a lack of access to the top ranked science and management journals. List 3 also lacks any of the new titles.

Finally, most of the titles on all the lists are commercially published and available at a significant cost. Consequently, libraries with limited budgets for purchasing access to commercial journals must decide where to invest; if they choose science titles over management ones, will fisheries managers lose out? Users of libraries not subscribing to *Fisheries Research* and *Ocean and Coastal Management* missed almost a third of the articles citing the Code core documents. The current cost of those two is roughly equal to *Aquaculture*, probably the most important commercial journal for scientists in that field. This apparent split between science and management challenges libraries in their collection development. It also challenges scientists and fisheries managers wanting to promote responsible fisheries concepts in the peer-reviewed literature. The choice of conduits is not always clear, and access to that publication not always easy for the potential reader.

Table 4.2: Fisheries & aquaculture journals: comparison of journals citing Code documents with journals used in fisheries science

List 1: 22 Journals citing the Code core documents (# articles)	**List 2:** Top 15 fisheries journals by 2003 ISI Impact Factor	**List 3:** 21 Fisheries journals used by African scientists	**List 4:** 15 Fisheries/aquaculture management journals
		African J. of Ecology	
African J. of Marine Sci.[20] (3)			
Aquaculture (4)	Aquaculture	Aquaculture	
			Aquaculture Econ. & Management
		Aquaculture Research[21]	
	Aquaculture Nutrition		
Aquaculture International (2)			
Aquatic Conservation (2)			
Aquatic Living Resources (2)			
		Archiv Hydrobiologia	
		Asian Fisheries Society	
Bulletin of Marine Science (2)			Bulletin of Marine Science
Can. J of Fish. & Aquatic Sci. (5)	Can. J. of Fish. & Aquatic Sci.	Can. J of Fish. & Aquatic Sci.	Can. J of Fish. & Aquatic Sci.
			Coastal Management
	Diseases of Aquatic Organisms		
Ecological Applications (3)			
	Ecology of Freshwater Fishes		
		Environmental Biology of Fishes	
	Fish & Shellfish Immunology		
		Fish Physiology & Biochemistry	
Fisheries Management & Ecol.[22] (4)		Fisheries Management & Ecol.	Fisheries Management & Ecol.
	Fisheries (AFS)		

[20] Formerly *South African Journal of Marine Science.*

[21] Formerly part of *Aquaculture & Fisheries Management.*

[22] Formerly part of *Aquaculture & Fisheries Management.*

List 1: 22 Journals citing the Code core documents (# articles)	**List 2:** Top 15 fisheries journals by 2003 ISI Impact Factor	**List 3:** 21 Fisheries journals used by African scientists	**List 4:** 15 Fisheries/aquaculture management journals
	Fisheries Oceanography		
Fisheries Research (17)	Fisheries Research		Fisheries Research
Fishery Bulletin (4)			Fishery Bulletin
		Fishery Technology	
		Freshwater Biology	
Hydrobiologia (2)		Hydrobiologia	
ICES J. of Marine Sci. (2)	ICES J. of Marine Sci.		ICES J. of Marine Sci.
			Intl. J. of Marine & Coastal Law
		Israeli J. of Aquaculture-Bamidegh	
J. of Applied Ichthyology (2)			
		J. of Aquaculture in the Tropics	
		J. of Aquatic Plant Management	
	J. of Fish Biology	J. of Fish Biology	
	J. of Fish Diseases	J. of Fish Diseases	
		J. of Ichthyology	
		Limnology & Oceanography	
Marine & Freshwater Research (2)	Marine & Freshwater Research		
Marine Policy (3)			Marine Policy
		NAGA, WorldFish Quarterly	NAGA, WorldFish Quarterly
Nippon Suisan Gakkaishi (2)			
		North American J of Aquaculture[23]	
Ocean & Coastal Management (9)			Ocean & Coastal Management
Ocean Development & Intl. Law (2)			Ocean Development & Intl. Law
Rev. in Fish Biology & Fisheries (3)	Rev. in Fish Biology & Fisheries		Rev. in Fish Biology & Fisheries

[23] Formerly *Progressive Fish Culturist*.

List 1: 22 Journals citing the Code core documents (# articles)	**List 2:** Top 15 fisheries journals by 2003 ISI Impact Factor	**List 3:** 21 Fisheries journals used by African scientists	**List 4:** 15 Fisheries/aquaculture management journals
Scientia Marina (3)			
South African J. of Marine Sci.[24] (3)			
	Trans. of the American Fish. Soc.		Trans. of the American Fish. Soc.

[24] Now *African Journal of Marine Science.*

A4.3 Three recent international compilations on responsible fisheries issues

Methodology

These three publications address responsible fisheries in various contexts and by a variety of contributors. They involve authors and an audience that crosses between the academic and the policy communities. Given the dates when these articles were originally presented, several Technical Guidelines and the IPOA on IUU would not have been published. FAO staff contributed to the content and editing of two of the volumes. The three compilations are as follows:

> *Responsible Marine Aquaculture*. 2002. Stickney, R.R. and McVey, J.P. (editors.) CAB International. (This compilation of 18 articles is based on a special session on aquaculture sustainability at Aquaculture 2001 in Orlando, Florida. The papers address issues ranging from environmental concerns to genetics to management.)
>
> *Responsible Fisheries in the Marine Ecosystem*. 2003. Sinclair, M. and Valdimarsson, G. (editors.) FAO Fishery Industries Division and CABI Publishing. (The 22 articles published here were originally presented at the 2001 Reykjavik Conference on Responsible Fisheries in the Marine Ecosystem sponsored by FAO and the Icelandic Ministry of Fisheries. Topics cover fisheries oceanography, fishing techniques and effects, management and legal perspectives.)
>
> *Current Fisheries Issues and the Food and Agriculture Organization of the United Nations.* Nordquist, M.H. and Moore, J.N. (editors.) 2000. Kluwer Law International. (The FAO and the Center for Oceans Law and Policy at the University of Virginia School of Law hosted a presentation on global fisheries at FAO in 2000. The 24 articles are primarily written by FAO staff and cover the major issue areas.)

Use of the Code core documents

Formal citing of the Code core documents is not as extensive as expected in the first two publications and is higher than anticipated in the *Current Fishery Issues* (Table 4.3). In *Responsible Fisheries*, four (18.8 percent) authors cite the Code itself and three cite technical guidelines. In all, the Code core documents are cited nine times by five authors. The aquaculture publication contains only five citations to the Code core documents, two to the Code and three to Technical Guideline 5. In comparison, 11 authors (7 FAO affiliated) in the *Current Fishery Issues* cite the Code core documents 17 times with 8 (33 percent) citing the Code itself. FAO authors cite four of the Technical Guidelines and the 1999 IPOA while one non-FAO author also cites the IPOA. What does this inconsistency of usage imply, especially for the first two publications?

One explanation is that the Code's subject does not resonate with the authors represented here; this does not appear valid given the concern of all with responsibility and sustainability within their sectors. It could simply be that authors assume the existence of the Code so while mentioning it in the text they do not formally cite it. This assumption is probably premature given the age of the Code and its application at regional and local levels. A more plausible explanation is that the Code and its technical guidelines were still new enough at the time of publication of these articles that the core documents were not yet readily in people's working set of information, so were not brought into the creation of their work. This holds well for the non-FAO authors. It was expected that most, if not all, of the FAO authors represented in these publications would formally cite the Code, however only five of the thirteen did so. Six FAO authors cited Technical Guidelines and two the 1999 IPOAs on seabirds, shark conservation and fishing capacity. Their references provide sparse evidence of active use and promotion of the Code and its supporting documents

Use of other information

Looking beyond the use of the Code core documents, the three publications have different patterns of information usage reflecting both their respective subject areas and the intellectual culture of the authors (Table 4.3). The differences are in relative usage of different categories of information and in amount of information cited. A quarter of the authors in the *Current Fishery Issues* do not cite information used while the majority of authors of articles in the two responsible publications do. *Responsible Fisheries* articles (excluding those without citations) have a median of 54.5 citations with a range from 21 to 102. Those in *Responsible Aquaculture* (excluding those without citations) have a median of 42.5 citations with a greater range, 7 to 211. The median of citations in *Current Fishery Issues* is lower (14.5) with a range from 4 to 84. There is considerable variation in number of citations in all of the articles, but the pattern illustrates the culture of citation in the more scientific approach found in *Responsible Fisheries* and *Responsible Aquaculture.*

This same culture is reflected in the high use of peer-reviewed articles in both *Responsible Fisheries* and *Responsible Aquaculture*, 62 percent and 48 percent of citations respectively. Authors in *Current Fishery Issues* do not cite peer-reviewed sources nearly as often. These authors are more likely to cite grey literature (27 percent), FAO publications (20 percent including the Code core documents), laws (16 percent) and conference proceedings (20 percent) than the peer-reviewed literature (11 percent). This contrast is striking and could be an indicator of the importance of grey literature to these management and policy authors. The high use of FAO publications by the authors contributing to *Current Fishery Issues* reflects the book's focus on FAO as well as the institutional base of a majority of the authors.

Differences between the citation patterns of authors in *Responsible Fisheries* and *Responsible Aquaculture* are less striking than in *Current Fishery Issues*. However, two may be important in explaining differences in the subject areas represented in these publications. First, the aquaculture authors cite the grey literature (27 percent) and conference proceedings (12 percent) more often than do the fisheries authors (17 percent and 6 percent). Trade and industry information appear more often in the aquaculture articles than fisheries ones. These findings along with the differing usage of peer-reviewed literature suggest that aquaculture authors use a broad range of grey literature. On the other hand, fisheries scientists and managers are more likely to find information needed in the peer-reviewed literature. Monographic material including books, encyclopaedias and dissertations are also used somewhat by authors in all publications. This category includes dissertations and theses; these are sometimes the sole source of information on certain species and techniques in aquaculture. Also, certain classic texts are important to fisheries.

Table 4.3: Information types in recent publications

	Totals		*Responsible Marine Aquaculture* [1]			*Responsible Fisheries in the Marine Environment*[2]			*Current Fishery Issues at FAO*[3]		
	# of citations	% of total	# Articles (#no cites)	# of citations	% of total	# Articles (#no cites)	# of citations	% of total	# Articles (# no cites)	# of citations	% of total
Total citations	2459		18 (2)	895		22 (3)	1161		24 (6)	403	
FAO Publications	117	4.8	9	14	1.6	13	40	3.5	12	63	15.6
Code of Conduct	14	0.6	2	2	0.2	4	4	0.3	8	8	2.0
Code Tech Guidelines	17	0.7	3	3	0.3	3	5	0.4	7	9	2.2
Peer-reviewed articles	1175	47.8	15	411	45.9	19	720	62.0	10	44	10.9
Monographs	144	5.9	13	55	6.2	16	78	6.7	7	11	2.7
Trade and industry publications	95	3.9	12	60	6.7	6	20	1.7	3	15	3.7
Conference Proceedings	256	10.4	14	103	11.5	18	73	6.3	14	80	19.9
Other grey literature	550	22.4	15	244	27.3	18	199	17.1	14	107	26.6
Law/treaties/resolutions	91	3.7	3	3	0.3	5	22	1.9	15	66	16.4

[1] Stickney, R.R. and McVey, J.P. (editors.) 2002. *Responsible Marine Aquaculture*. Wallingford, United Kingdom, CABI Publishing.
[2] Sinclair, M. and Valdimarsson, G. (editors.) 2002. *Responsible Fisheries in the Marine Ecosystem*. Wallingford, United Kingdom, FAO Fishery Industries Division and CABI Publishing.
[3] Nordquist, M.H. and Moore, J.N. (editors.) 2000. *Current Fisheries Issues and the Food and Agriculture Organization of the United Nations*. Hague, Kluwer Law International.

A4.4 Information produced by governmental and non-governmental organizations

Methodology

The documents produced by various governmental and non-governmental organizations that address the Code are elusive. Most FAO Members that responded to the Fisheries Department's 2002 questionnaire on Code implementation favourably indicated that they conform to the *Code of Conduct* (FAOb, 2003 para.21*)*. The Members also reported that 472 marine fishery management plans and 228 inland fishery management plans have been developed though implementation lags significantly behind development (Ibid. para.22). However, few of these plans are readily available electronically or in print. Consequently, the documents listed under "National Initiatives" and "Regional Initiatives" on the Fisheries Department Code of Conduct web site were examined and the references noted. FAO generated documents were excluded as the focus of this approach was on those outside of FAO. Additional documents were identified by following links and searching the World Wide Web. This was a small sampling rather than an exhaustive search and it was limited to those documents published in English. In total, thirteen documents were examined including six from the United States, two from Canada, four from Australia and one from an NGO. The documents examined are listed in Table 4.4.

Table 4.4: National and NGO documents examined

Title	Country of origin or producer	Date
National Plan of Action for the Management of Fishing Capacity	US	2/2003
National Plan of Action on the Reduction of Seabird Bycatch in Longline Fisheries	US	2/2001
Implementation Plan for Code of Conduct for Responsible Fisheries	US	7/1997
Draft for Public Review of the National Plan of Action of the United States of America to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing	US	2/2003
Final United State National Plan of Action for the Conservation and Management of Sharks	US	2/2001
Technical guidelines on the use of precautionary approaches to implementing National Standard 1 of the Magnusson-Stevens Fishery Conservation and Management Act	US	7/1998
Canadian Code of Conduct for Responsible Fisheries	Canada	1998
Implementation of the Code and its Guidelines in the Commercial Geoduck and Horse Clam Fishery in British Columbia	Canada	[NA]
Threat abatement plan for the incidental catch of seabirds during oceanic longline fishing operations	Australia	3/1998
White Shark (Carcharodon carcharias) Recovery	Australia	2002
Marine protected areas in ecosystem-based management of fisheries	Australia	2003
Code of Conduct for a Responsible Seafood Industry	Australian Seafood Industry Council	[NA]
Eastern Tuna and Billfish Fishery: Industry Code of Practice for Responsible Fishing	Australian East Coast Tuna Boat Owners	2003
Policy proposals and operational guidance for eco-system-based management of marine capture fisheries	World Wildlife Fund	2/2002

Use of the Code core documents

Most of the documents listed in Table 4.4 mention the *Code* whether in formal citations or in the document text (Table 4.5). The *Code* is mentioned in 10, the IPOAs are mentioned in 6 (five of the US ones), and Technical Guideline 4.2 receives one mention. The authors of these pieces are aware of the Code given the subjects of their work and, it is a positive sign that they actively refer to it. This promotes the Code to those who read these documents.

The most accessible documents for this part of the study were those easily located on the Web. The Australian seafood and fishing industry incorporates the Code into their planning and in communications to their constituents. The term "Code" has been widely adopted and codes of practice developed for various parts of the fisheries sector. In the US, all Code-related documents we identified are government generated. One measure of Code success is its appearance in the publications of the industry in addition to government legislation and policy.

Use of other types of information

As a group, these documents are most likely to cite peer-reviewed literature (31 percent), the grey literature of the publishing body (22 percent) and other grey literature (17 percent). This pattern changes somewhat within each group. (We do not include the Canadian document in this summary discussion given the lack of an adequate sample.) The Australian and World Wildlife Fund documents use peer-reviewed literature more often than the US documents (38 percent, 35 percent and 24 percent respectively.) All use grey literature at a similar rate if we combine other grey literature with the grey literature of the publishing body. The US documents rely more extensively on US government information than do the other two on their own information (28 percent compared to 19 percent and 15 percent). The US has most of the legal citations in the group reflecting the policy nature of the documents. The World Wildlife Fund document cites conference proceedings considerably more than others. There remains a heavy reliance on peer-reviewed literature in addition to a variety of grey literature.

Table 4.5: Information types cited by selected national and NGOs documents examined

	Total for all documents		United States of America		Australia		World Wildlife Fund		Canada	
	Total # citations	% of total	Total # citations	% of total	Total # citations	%of total	Total # citations	% of total	Total # citations	% of total
	489		214		215		52		8	
FAO publications	14	2.9	8	3.7	4	1.9	2	3.9		
Code of Conduct	11	2.3	7	3.3	3	1.4			1	12.5
Code Tech Guidelines & IPOAs	8	1.6	6	2.8	2	0.9				
Grey literature of publisher	108	22.2	59	27.6	41	19.1	8	15.4		
Peer-reviewed articles	150	30.9	51	23.8	81	37.7	18	34.6		
Monographs	29	6.0	10	4.7	15	7.0	4	7.7		
Trade and industry publications	7	1.4	1	0.5	6	2.8				
Conference proceedings	34	7.0	9	4.2	13	6.1	9	17.3	3	37.5
Other grey literature	84	17.3	23	10.8	47	21.9	11	21.2	3	37.5
Law/treaties/resolutions	44	9.0	40	18.7	3	1.4			1	12.5

A4.5 Information produced by selected organizations with a regional or international focus

Methodology

The publications of several international and intergovernmental organizations were reviewed to ascertain three things:

- are these organizations publishing material about the Code and responsible fisheries?
- if so, do the publications reference the Code core documents?
- what other types of information is referenced?

Publications produced prior to 1996 were excluded. The organizations reviewed were the WorldFish Center, SEAFDEC, NACA and ICSF. The number of documents varied, but a representative number of citations were found. Few are publishing documents specifically addressing the Code, yet all do produce publications on responsible fisheries and aquaculture. Some of the documents examined were the proceedings of conferences organized by these organizations. The individual papers were examined even though authored by people outside of the organization. It was felt that the use of information by these authors would give additional perspective on the organizations themselves and their constituencies. In fact, more insight on the differences in access to and use of information in different countries could be obtained by closer examination of the citation patterns in several of the NACA proceedings and the WorldFish proceedings. For the purposes of this report, the citations were grouped by broad types.

Use of the Code core documents

In general, the Code core documents are poorly referenced (Table 4.6). WorldFish Center documents do not reference the Code itself, but do refer specifically to the aquaculture related Technical Guidelines. SEAFDEC proceedings and reports rarely cite the Code. NACA publications mention the Code documents more than SEAFDEC. ICSF makes the most frequent mention of the Code in its journal, *Samudra*, and also discusses the IPOAs there. All in all, outside of news articles about the Code, there is little active integration of the Code into the publications of these organizations.

Use of other types of information

Peer-reviewed articles are used by all of these organizations but at very different levels (Table 4.6). Of the four organizations, ICSF has the least reliance on the peer-reviewed literature (16 percent) as its publications have a mixed audience. Grey literature remains vital to the publications of all the organizations. There is variety, though, in the reliance on the organization's own publications, e.g. self referencing. Twenty-four percent of the citations in ICSF and 21 percent of SEAFDEC are to their own publications while WorldFish self references 12 percent of the time. NACA documents were not included in this count. All use conference proceedings with SEAFDEC being the heaviest user (21 percent). Monographs are also used more regularly by these organizations than the academics, the research community and the governmental and non-governmental policy-makers. FAO publications in general are cited consistently.

Comparing the use of grey literature versus peer-reviewed literature among the four organizations reveals differences in usage. The total for all four organizations shows 44 percent of citations are to grey literature (if all categories are combined: organizational publications, conference proceedings and other grey literature) versus 31 percent to peer-reviewed articles. However, WorldFish and NACA have similar ratios to each other and show a higher reliance on the peer-reviewed literature. This reflects the nature of their publications as more scientific (e.g. conference proceedings or compilations of papers) than those of ICSF and SEAFDEC. These two organizations rely far more on grey literature. Over half of ICSF's citations are to grey literature while SEAFDEC's reliance is even higher at 62 percent. This reiterates the importance of local and regional information. It also suggests that there is great variety in what information is accessible in different parts of the world and in different communities of users.

Table 4.6: Information types used in the publications of selected organizations with a regional or international focus

	Totals		WorldFish Center[1]		ICSF[2]		SEAFDEC[3]		NACA[4]	
	Cites	%	Cites	%	Cites	%	Cites	%	Cites	%
Type of Information Cited	3802	100.0	**947**	**100.0**	**257**	**100.0**	**1083**	**100.0**	1515	**100.0**
FAO Publications	261	6.9	52	5.5	21	8.2	48	4.4	140	9.2
Code of Conduct	21	0.6	0	0.0	13	5.1	2	0.2	6	0.4
Code Tech Guidelines and IPOAs	7	0.2	2	0.2	3	1.2	0	0.0	2	0.1
Grey literature of publisher	461	12.1	123	13.0	62	24.1	230	21.2	46	3.0
Peer-reviewed articles	1179	31.0	390	41.2	42	16.3	235	21.7	512	33.8
Books, Dissertations, Encyclopaedias	311	8.2	87	9.2	27	10.5	83	7.7	114	7.5
Trade and industry publications	254	6.7	74	7.8	17	6.6	40	3.7	123	8.1
Conference Proceedings	583	15.3	132	13.9	22	8.6	223	20.6	206	13.6
Other grey literature	611	16.1	82	8.7	43	16.7	220	20.3	266	17.6
Law/treaties/resolutions	114	3.0	5	0.5	7	2.7	2	0.2	100	6.6

[1] 8 documents
[2] 7 documents
[3] 11 documents
[4] 4 documents (conference proceedings)

A4.6 Information types used in the Code core documents

Methodology

The final community of users is the FAO Fisheries Department and those who produce the Core publications. The publications examined have been described earlier in Part 1.2.1 as the Code core documents. These documents do not consistently or formally cite publications used by their authors and the formats and writing styles clearly show different approaches by the authors. The addition of references as a bibliography, footnotes or endnotes would be helpful to a reader interested in knowing more about the subject and the authority of the document's content.

Those that include citations or references are five of the twelve Technical Guidelines, three of the four FishCode Reviews and the 1999 IPOAs. These publications were examined to see how the Code core documents were referenced, and then to identify the types of other information used. There is great variation in the amount of information cited in these publications ranging from 4 citations in Technical Guideline 8, *Indicators for Sustainable Development of Marine Capture Fisheries*, to 127 in the Technical Guideline 5, *Aquaculture Development*.

Use of Code core documents

Table 4.7 shows the citations of the Code publication by the type of information cited. The shaded area indicates how the various authors of the Code documents reference other Code documents. Currently, the Code core documents are not consistently reiterated throughout all Code documents. While most have a background piece or foreword detailing the history of the Code, few make it an active part of the document. This is partly stylistic as the technical guidelines are written by different authors and for various audiences. For instance, the *IPOA on Illegal, Unreported and Unregulated Fishing*, which is a more legalistic document than many of the guidelines, is not structured as a publication with citations or legal footnotes. In other cases, authors focus on particular topics rather than reiterating the policy framework of the Code topics. Here an example is *Technical Guideline 1.1* on vessel monitoring systems. The Code is referenced in a standard background or foreword, yet is not fully integrated into the topic's context. In contrast, *Technical Guideline 4.1* on the fisheries management of sharks has the standard foreword explaining the *Code*, and then appropriately references the IPOA on shark fisheries throughout the text.

Use of other types of information

All the Code core documents with citations use FAO Fisheries publications and nine of the eleven use grey literature. There are neither obvious patterns of usage nor consistent items cited by all. Information usage is specific to the topic of each guideline. This is most obvious in Technical Guideline 5.1, *Good Aquaculture Feed Manufacturing Practices*, and its extensive use of industry and encyclopaedic information; the feed industry is a valid source of product and manufacturing process descriptions as well as giving insight into commonly accepted practices and standards.

These documents make extensive use of other FAO publications especially those of the Fisheries Department. In fact, over a third of the citations are to FAO publications. This is not unexpected as these are the working documents of the Department, the publications of greatest familiarity and accessibility. The category of FAO miscellaneous reports includes those not published in a regular series. Some have limited circulation such as the confidential "Back to Office" reports which are restricted to FAO staff. Most references to FAO material are to the regular series of the Fisheries Department, the Technical Papers, Reports, and Circulars. These are widely distributed in print as well as being made accessible electronically.

Authors of the Code documents rely heavily on the grey literature, material that is usually less widely distributed, not subject to formal review, and not well preserved. References to conference

proceedings and other grey literature account for 32 percent. Trade, industry and civil society information (e.g. newspapers) contribute 9 percent of the references and the vast majority of these are in the Technical Guideline 5.1 on aquaculture feed manufacturing practices.

The peer-reviewed articles account for 21 percent of the citations, and are cited in six of the eleven documents. Twenty-three different peer-reviewed journals are cited, and only two, *Journal of Fish Biology* and *Aquaculture*, are cited by more then one author. Half of the titles appear on one or more of the lists in Table 4.2. Books, encyclopaedias and dissertations are cited 9.5 percent of the total reference. Legal references are minimal, but include the relevant agreements and conventions[25].

[25] Examples of these include the United Nations Convention of the Law of the Sea of 10 December 1982 and the Agreement for the Implementation of the United Nations Convention on the Law of the Sea of 10 December 1982, relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks,

Table 4.7: Information types in Code core documents

	Total	% of Total	TG 4.1	TG 4.2	TG 5	TG 5.1	TG 7	TG 8	TG 9	IPOA 1999	FishCode 4	FishCode 5	FishCode 6
Total Citations	**422**		**14**	**19**	**127**	**97**	**14**	**4**	**31**	**5**	**46**	**57**	**8**
FAO miscellaneous reports	**39**	9.2	3		18	8			4		2	2	2
FAO series publications	**38**	9.0	2		15	10	3	1	1		6		
FAO Fisheries Tech Papers	**30**	7.1	1	3	14	1	2		1		1	7	
FAO Fisheries Reports	**14**	3.3			8					5		1	
FAO Fisheries Circulars	**16**	3.8			7	1	4		2		1		1
Code of Conduct	**6**	1.4	1		1		1		1			1	1
Code Technical Guidelines													
#1													
#1.1	**1**	0.2							1				
#2	**2**	0.5	1	1									
#3	**1**	0.2			1								
#4	**2**	0.5			1							1	
#4.1													
#4.2													
#5	**2**	0.5				1						1	
#5.1													
#5.2													
#6	**1**	0.2										1	
#7													
#8	**2**	0.5	1	1									
#9	**1**	0.2											1
IPOA 1999	**1**	0.2							1				
IPOA IUU													
Peer-reviewed articles	**44**	10.4	2		9	12			3		2	16	
Books and other publications	**40**	9.5	1	4	9	20			2		1	3	3
Trade and civil publications	**36**	8.5			3	32	1						
Conference Proceedings	**39**	9.2	1	2	13	5	1				1	3	
Grey literature	**98**	23.2	1	7	25	7	2	3	13		30	21	
Law/treaties/resolutions	**9**	2.1		1	3				2		2		

ANNEX 5

CASE STUDIES

International Collective in Support of Fishworkers (ICSF)

ICSF Documentation Centre
27 College Road, Chennai 600 006, India
Tel: 91-44-28275303 Fax: 91-44-28254457
Email: icsf@icsf.net
Website: www.icsf.net www.icsf.org
Contact: Ms Ramya Rajagopalan, Programme Associate, icsf@vsnl.com

Description:

The ICSF is an international non-government organization that works towards the establishment of equitable, gender-just, self-reliant and sustainable fisheries, particularly in the small-scale, artisanal sector. ICSF draws its mandate from the historic International Conference of Fishworkers and their Supporters (ICFWS), held in Rome in 1984. The main aims of ICSF are to:

- monitor issues that relate to the life, livelihood and living conditions of fishworkers around the world;
- disseminate information on these issues, particularly amongst fisherfolk;
- prepare guidelines for policy-makers that stress fisheries development and management of a just, participatory and sustainable nature; and
- help create the space and momentum for the development of alternatives in the small-scale fisheries sector. (Summarized from the ICSF web site.)

Digitization Efforts:

ICSF produces numerous publications and most are available digitally. The organization is committed to disseminating its publications widely and finds that digital access is appropriate for much of it audience. Publications are available in print upon request.

Key Issues with Digitization Efforts:

- digitizing publications in languages other than English;
- lack of Internet access among fish worker organizations;
- assisting is the development of databases and providing increased access to information from Portuguese, French and South African Link centres.

Key Opportunities of Digitization Efforts:

- capability to reach broad, global audience with information about fishworkers;
- develop unique information resource on fishworkers from wide variety of sources.

Table 5.1: ICSF work form for documents with possible mapping to Dublin Core

WinISIS Database Field	Dublin Core Field
Accession Number:	Identifier
Document Type:	Type
Record Type:	
Date of Entry:	
Language of the record:	Language
ISBN:	
ISSN:	
Title and Statement of responsibility:	Title
Parallel title:	Title
Edition and Stat. Of responsibility:	Creator
Name – Persons: (Author)	Creator
Name – Corp Body:	Creator
Name – Conference Meeting:	
Imprint: (Publication details)	Publisher
Volume No:	
Issue No:	
Month:	
Year:	Date
Physical Description:	Format
Series:	
Source:	Relation
Notes:	
Keywords:	Subject
Class number:	Subject
Abstract:	Description

Table 5.2: ICSF publications

Series Title	Volume/Year as of 2004	Format	Language
Samudra Report	No. 1 (1988) - No. 37 (2004)	print, pdf	Eng, Fr, Sp
Yemaya: ICFS's newsletter on gender and fisheries	No. 1 (1999) - No. 15 (2004)	print, pdf	Eng, Fr, Sp
Samudra Dossier			
Afrique de l'ouest peche artisanale defies et enjeux	No. 1. 1989	print	
Resource management European viewpoints	No. 2 1989	print	
Evolution des peches et avenir des travailleurs	No. 3. 1990	print	Eng, Fr
Fisheries agreements under the Lome Convention	No. 4 1991	print	
Fish Stakes: A debate on the pros and cons of the Marine Stewardship Council	1998	print, pdf	
Dangerous calling (The life- and -death matter of safety at sea: a collection of articles from SAMUDRA Report)	2004	print, pdf	

Series Title	Volume/Year as of 2004	Format	Language
Gender Agenda (Women in Fisheries: a collection of articles from SAMUDRA Report)	2004	print, pdf	
Women in Fisheries Dossier	–		
Public Hearing on the Struggles of Women Workers in the Fish Processing Industry in India	No. 1 1995	print	Eng, Fr, Sp
Women First: Report of Women in Fisheries Programme of the ICSF in India	No. 2 1997	print	
Women for Sustainable Fisheries: Report of the First Phase of the Women in Fisheries Programme of ICSF	No. 3 1997	print	
Globalisation, Gender and Fisheries: Report of the Senegal Workshop on Gender Perspectives in Fisheries	No. 4 1997	print	
Les femmes et la Pêche au Sénégal, Rapport du programme "Femmes dans la Pêche" d'ICSF au Sénégal	No.5 1998	print	Fr
Samudra Monograph			
Fishing Legislation and Gear Conflicts in Asian Countries	No. 1 1990	print	
Le Credit a la Peche Artisanale en Afrique Deloust	No. 3 1992	print	Eng, Fr, Sp
Nets for Social Security- An Analysis of the Growth and Changing Composition of Social Security. J. Kurien and A. Paul	2000	print	
Occasional Papers:			
The Impact of TRIPS and CBD on Coastal Communities. A. R. M. Prat	2003	pdf	Eng, Sp
Monograph Titles published from 2002 to spring 2004			
Conversations: A Trialogue on Power, Intervention and Organization in Fisheries. A. Sall, M. Belliveau and N. Nayak	2002	print	
West Africa Market Study	2002	pdf	
Workshop on Gender and Coastal Fishing Communities in Latin America	2002	pdf	
Proceedings of the Indian Ocean Conference "Forging Unity: Coastal Communities and the Indian Ocean's Future"	2003	print	
Fishing for Standards (ICSF Dossier-A collection of articles on ILO's proposed comprehensive standard on work in the fishing sector)	2004	print,pdf	
Fisheries in Sub-Saharan Africa	2002	CD	Eng, Fr
International Instruments and Institutions of relevance to Fisheries	2003	CD	
Smoke in the Water: Problems and Prospects for Developing Artisanal Fish Trade in West Africa	2002	Video	Eng, Fr
A Step Forward: A Film on Women Fishworkers in India	2002	Video	
Under the Sun: The Transient Fisherfolk of Jambudwip	2003	Video	

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Contact: Simon Wilkinson Simon.wilkinson@enaca.org

Description:

NACA, an intergovernmental organization created in the early 1980s as an FAO project, promotes rural development in 15 Asia-Pacific countries through sustainable aquaculture. The current member governments include Australia, Bangladesh, Cambodia, China, Hong Kong SAR, India, Korea (DPR), Malaysia, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Thailand, and Viet Nam. Other participating (non-member) governments include Indonesia, Iran, Rep. of Korea, Lao PDR and Singapore. The members form a Governing Council that directs policy and activities. FAO is a non-voting member of the council. NACA conducts development assistance projects throughout the region in various partnerships. NACA supports institutional strengthening, technical exchange and the development of policies for sustainable aquaculture and aquatic resource management. (Summarized from theNACA web site).

One of NACA's core activities is the development of communication and information networks amongst the member countries. Its Information Center, staffed by one manager, and two assistants, is charged with managing NACA's information as well as producing the serial publications and providing technical assistance in communications to the members.

Digitization efforts:

NACA's Information and Communication Program is committed to information in a digital format as the best means of sharing it widely and quickly. Consequently, NACA produces its publications almost exclusively in digital form, reformats members' information, collects other appropriate digital content and supports communities of users through its web site. XOOPS, an Open Source web content management software, is used for the NACA web site, Pagemaker for the serial publications and pdf formats for other digital content.

Key issues with digitization efforts:

- collecting and providing access to non-English publications;
- building organizational capacity for knowledge management in a decentralized environment;
- variety of Internet access throughout member countries;
- managing the growing amount of digital information in terms of quality, archiving and searchability;
- lack of planning for and integration of information dissemination in projects.

Key opportunities of digitization efforts:

- enthusiasm and interest in web delivery if information;
- development of Open Source products for website management and delivery;
- high level of entrepreneurial spirit in the region;
- growing bandwidth throughout region.

Table 5.3: Mapping ASFA fields to Dublin Core

ASFA Fields	Dublin Core
English Title Non-English title English monographic title Non-English monographic title	Title
Personal Author Corporate Author Personal Author (Monographic) Corporate Author (Monographic)	Creator
Primary Classification Codes Subject Descriptors Taxonomic Descriptors Geographic Descriptors Identifiers	Subject
English abstract	Description
Publisher	Publisher
Personal Author (Collection) Corporate Author (Collection)	Contributor
Date of Publication	Date
Type of document Literary Style	Type
Physical medium	Format
TRN Online availability/URL address Digital Object identifier	Identifier
Language of text	Language

Table 5.4: NACA publications

Series Title	Volume/Year as of 2004	Format	Language
Aquaculture Asia Magazine	V. 1 1996- V. 8 2003	print, pdf, CD	
NACA Newsletter	1982 - v.18(3) 2003	print, pdf	
Grouper Electronic Newsletter	No. 1 1999 – No. 16 2002	pdf	
Marine Finfish Newsletter	No. 1 2002 - No. 7 2003	pdf	
Marine Finfish E-News	No. 1 2003 – No. 10 2004		
Stream Journal	V. 1 (1) 2002 - V. 2 (1) - 2003	pdf	Eng, Khmer, Ilonggo, Nepali, Vietnamese,
Shrimp Media Monitoring	No. 1 Jan 2004 – No.2 Feb 2004	pdf	
Trade Media Monitoring	No. 1 Oct 2003 – No. 6 Mar 2004	pdf	
Health Media Monitoring	No. 1 Jan 2004 – No. 3 Mar 2004	pdf	
Quarterly Aquatic Animal Disease Report	Q1 2003 – Q4 2003	pdf	
NACA Governing Council Meeting Report	1992 -		
NACA Technical Advisory Committee Meeting	1993 -		
Report of the Director General to the Governing Council Meeting	No. 14 2004	pdf	
Monograph Titles published from 2002 to spring 2004		**Format**	**Language**
Consortium Program on Shrimp Farming publications			
Thematic reviews	2002 (5)	pdf	
Draft Synthesis Report: Shrimp Farming and the Environment	2002 (2)	pdf	Eng, Sp
Case Studies			
Africa and Middle East	2002 (1)	pdf	
Asia-Pacific	2002 (10)	pdf	
Latin America	2002 (10)	pdf	
Report of the Regional Workshop on Sustainable Seafarming and Grouper Aquaculture, Medan, Indonesia, 17-20 April 2000.	2002	print	
Summary Report of the Emergency Disease Control Task Force on a Serious Disease of Koi and Common Carps in Indonesia	2002	pdf	
Regional Workshop on Sustainable Marine Finfish Aquaculture for the Asia-Pacific, 30 September – 3 October 2002, Halong City, Vietnam	2002	CD	

Monograph Titles published from 2002 to spring 2004	Volume/Year as of 2004	Format	Language
Report of the APEC/NACA Cooperative Grouper Aquaculture Workshop, Hat Yai, Thailand, 7-9 April 1999	2002	pdf	
Report on the formalization of an Asia-Pacific marine finfish aquaculture network	2002	pdf	
Sustainable Livelihood Studies of Fishers and Farmers in Cambodia	2002 (6)	print, pdf	Eng, Khmer
Information Access Survey: Vietnam	2003	print, pdf	
Information Access Survey, Western Visayas, The Philippines	2003	print, pdf	
Information Access Survey, Cambodia	2003	print, pdf	
Background paper on the International Seafood Trade and Poverty	2003	print, pdf	
Improving Coastal Livelihoods Through Sustainable Aquaculture Practices	2003	print, pdf	
System Requirement for Level 2-National Management Institutions, for the Bureau of Fisheries and Aquatic Resources in the Philippines	2004	print, pdf	

Bunda College of Agriculture

Library, Bunda College of Agriculture
University of Malawi, P.O. Box 219, Lilongwe, Malawi
Tel: 265-277222 Fax : 265-277364
Web site: http://chirunga.sdnp.org.mw/bunda/fish.htm
Contact: Geoffrey Salanje, University Librarian gsalanje@sdnp.org.mw
Contact: Margaret Ngwira, Associate University Librarian tnmngwira@globemw.net

Description:

Bunda College of Agriculture, founded in 1967, has graduated over 3000 students with diplomas, 1700 with BSc, 700 with MSc and 1 PhD. It focuses on natural resources, agriculture and basic studies including research, teaching and outreach. The Library is housed in a pleasant, spacious facility with adequate wiring for connectivity. The library is open seven days a week when classes are in session. There are three librarians, six library assistants, two messengers and three guards. Funding for staff positions is part of the monthly government subvention administered by the College Management. The collection is funded with a variety of grants. Recent ones include $30,000 from NORAD over two years and another from ICEIDA. The collection has approximately 40,000 books and 10,000 bound periodicals. There is a special Malawiana collection containing books about Malawi or written by Malawians.

Digitization efforts:

While eager to move forward with digitization of Malawi aquaculture information, the Bunda College Library is cautious. The benefits of providing digital access include potential savings in printing and postage costs as well greater exposure to local content. Staff training and workflow demands would be possible costs as well as replacing equipment over time. The University of Malawi Libraries needs to develop a direction for digital libraries in the country. They know that success will be based on working together and supporting each others efforts. Sharing expertise and solutions to challenges will make the project possible.

Key issues of digitization efforts:

- identifying and collecting documents produced in Malawi
- recognizing information needed to support responsible fisheries
- staff capacity and expertise
- sustaining existing electronic networks and access to resources

Key opportunities with digitization efforts:

- interested and committed library administration
- personnel with expertise and interest in networking
- willingness to cooperate among fisheries libraries
- manageable number of fisheries publications produced in Malawi
- locally developed aquaculture database as starting point

Table 5.5: Bunda College Library Aquaculture Database Work Form

WinISIS Database Field	Dublin Core Field
Accession Number:	Identifier
Document Type:	Type
Record Type:	
Date of Entry:	
Language of the record:	Language
ISBN:	
ISSN:	
Title and Statement of responsibility:	Title
Parallel title:	Title
Edition and Stat. Of responsibility:	Creator
Name – Persons: (Author)	Creator
Name – Corp Body:	Creator
Name – Conference Meeting:	
Imprint: (Publication details)	Publisher
Volume No:	
Issue No:	
Month:	
Year:	Date
Physical Description:	Format
Series:	
Source:	Relation
Notes:	
Keywords:	Subject
Class number:	Subject
Abstract:	Description

Table 5.6: Bunda College of Agriculture Publications:

Series Title	Volume/Year as of 2004	Format	Language
Aqua-Fish Technical Report	No.1 (Nov. 2002)- No. 2 (Nov. 2003)	print	Eng
Bunda Journal of Agriculture, Environmental Science and Technology	No. 1 (April 2003) – No. 2 (April 2004).	print	Eng
Bunda College Newsletter	No. 1 (May 2004)	print	Eng

Institut mauritanien de recherches océanographiques et des pêches (IMROP)

Library, B.P. 22
Nouadhibou, Mauritania
Tel: 00(222)6 36 06 39 Fax: 00(222) 5745 825
Contact: Amady Sow tijouceddo@yahoo.fr ; a.sow4@caramail.com

Description:

Created in 1952, IMROP focuses on building knowledge about the fishing and ocean resources of Mauritania. Programmes include stock assessment, evaluating constraints on artisanal fisheries, marine mammal studies, variability and durability of Mauritanian upwelling, and seafood inspection among others. The library has a strong collection of 8500 volumes and 92 serial subscriptions. It is staffed by one librarian and three assistants. CDSISIS has been used for more than 12 years for collection management. As an ODINAFRICA participant, the library is migrating systems to INMAGIC although CDS/ISIS may still be used for certain operations. The library is also responsible for editing and distributing the IMROP Bulletins and other institutional publications.

Digitization efforts:

IMROP produces regular reports and occasional monographs. Additionally, the Library collects papers and theses as produced. Digitization of all of these is a long-term project that is currently in the planning stage. The Library has great interest in making the institution's reports more accessible to a broader audience. As a member of the ODINAFRICA network, the IMROP Library may be a pilot partner in a digital repository for that network.

Key issues with digitization efforts:

- access to technical information on digitization in French;
- adequate and consistent staff expertise; and
- identifying which database/library software program is appropriate for metadata generation.

Key opportunities of digitization efforts:

- ODINAFRICA institutional repository project;
- interest and support from IMROP Administration; and
- manageable publication output.

Table 5.7: Inmagic workform for documents with possible mapping to Dublin Core

Inmagic Database Field	Dublin Core Field
Title	Title
Subtitle	Title
Author	Creator
Corporate Author	Creator
Responsibility	Creator
Source (journal)	Source
Publication Date	Date
Place	
Publisher	Publisher
Vol	
No.	
Pages	
Descriptors	Subject
Abstract	Description
Classification #	
Location	
Label information	Identifier
Type	Format

Catalogue de la bibliothéque du IMROP	IMROP Field #	Dublin Core Field
Titre proper (245)	245	Title
Autre titre (246)	246	Title
Edition and Stat. Of responsibility:		Creator
Auteur individual (100/700)	100/700	Creator
Auteur collectivité (110/710)	110/710	Creator
Auteur conference (111/711)	111/711	
Les descripteurs géographiques (651)	651	Subject
Classification ASFA:	690	Subject

Table 5.8 IMROP Publications

Series Title	Volume/Year as of 2004	Format	Language
Bulletin Scientifique de l'IMROP	No.1 1970 – No. 80 2002	print	Fr
Les archives de l'IMROP (CNROP prior to 2002)	No.1 1983 – No. 95 2002	print	Fr
La Lettre de l'IMROP	No. 1 1998 -	print	Fr
Rapports de groupes de travail/séminaire		print	Fr
Les Groups de travail IMROP sur l'évaluation des stock de la ZEE mauritananienne	1985 – 2003 (5)	print	Fr
Séminaires sour-régionaux	1990 – 1992 (2)	print	Fr
Séminaries / Groupes de travail nationaux	199? – 2002 (4)	print	Fr
Le rapports techniques		print	Fr
Les rapports de projets		print	Fr
Les rapports de stage		print	Fr
Bulletin de statisque de la SMEP		print	Fr
Bulletin de la CEAMP		print	Fr
Bulletin Statistique de la DSPCN		print	Fr
Rapport d'activité	- 2002		
Plan d'action	- 2003		
Bilan du plan quinquennal	- 2003		
Monograph Titles published from 2002 to spring 2004			
Etude pour le plan dáménagement des ressources halietiques en République Islamique de Mauritanie	2002	print	Fr

ANNEX 6

IAMSLIC FRAMEWORK FOR IMPROVED SHARING OF AQUATIC SCIENCE INFORMATION

IAMSLIC, as the professional library and information association most concerned with fisheries and aquaculture, provides a forum to discuss and encourage participation in the use of technology to enhance access to fisheries information. IAMSLIC is building on the informed discussion of recent years to provide ways for aquatic science libraries to collaborate more broadly. These include the following actions:

- developing a distributed network of resource sharing;
- maintaining a union list of marine science serials (including fisheries and aquaculture);
- funding of projects proposed by IAMSLIC members through small grants;
- creating a web portal for digital aquatic resources;
- endorsing standards for digital projects;
- supporting of a digital framework to improve access to fisheries and aquaculture information.

The IAMSLIC Z39.50 Distributed Library is a project aimed at facilitating international resource sharing among marine and aquatic science libraries. This was developed as a joint project of the IAMSLIC Resource Sharing Committee, the California State University, Monterey Bay Library and the NOAA Coastal Services Center in Charleston, South Carolina, USA. It is modeled on the Coastal Information Library developed by the NOAA Coastal Services Center and utilizes the PHP/YAZ open source Z39.50 protocols.

Started in 1992, the Union List of Marine and Aquatic Serials is a volunteer project to facilitate interlibrary loan programmes among marine science libraries by providing a list of which libraries own specific journals. Those needing a specific article from a journal can search the list, identify libraries owning the journals and then generate a request to that library. The list facilitates identifying obscure titles and those with limited distribution. The original list of serials was derived from the list of source journals for Aquatic Sciences and Fisheries Abstracts. The union list is now incorporated into the IAMSLIC Z39.50 Distributed Library. Currently, more than 55 libraries participate in this project.

Funding is a constant barrier to exploring methods and means to expand access to fisheries information. IAMSLIC has limited funding but can be effective by continuing to support local initiatives with small grants. Such funding can be used to leverage additional grants from local and international organizations. IAMSLIC supports efforts to enhance the ability of developing countries to create, access, and share information.

IAMSLIC's Web portal *Aqua Terra* (http://cwis.fcla.edu/iamslic) provides a means to index the vast array of Web resources that are of interest to IAMSLIC members and their primary user groups. It uses the CWIS software, developed by the University of Wisconsin with funding from the U.S. National Science Foundation with the specific goal of helping groups develop OAI-compliant repositories of subject oriented metadata. The goal of those building *Aqua Terra* is to mine content beyond top-level institutional pages which is the focus of the Intergovernmental Oceanographic Commission's *OceanPortal*.

IAMSLIC members have long recognized the importance of shared standards and methodologies. As more members initiate digitization projects and linkages to digital resources, IAMSLIC encourages members to refer to these accepted guidelines:

- IFLA *Guidelines for Digitization Projects* (IFLA, 2003);
- *Western States Digital Imaging Best Practices* (Colorado Digitization Program, 2003);
- *Handbook for Digital Projects* from the U.S. Northeast Document Conservation Center (Sitts, 2000).

Suggested scanning guidelines are derived from the above sources and the experience of IAMSLIC members. In general, the format should be ITU TIFF (T.6) uncompressed. The colour space (black and white, grey-scale, or colour) should be appropriate to the resource, e.g. coloured materials should be imaged in colour, black and white photographs in grey-scale. Bit–depth (1-bit/black and white, 8-bit/ grey-scale, or 24-bit/colour or higher) should be appropriate to the resource and anticipated uses. The greater the bit-depth, the greater the file size, but also the better the image quality. Scale to Source should be 100 percent. There should be no image size reduction in creation of the digital master.

There are two products from the scanning of images: a master digital object and the derivative or access digital object. When scanning photographs, engravings, etc. for the master digital object, recommended resolution is 600 dpi or 236 dpc (Table 6.1). This capture will support zoom applications such as JPEG2000. The format standard for the access digital object will be JPG with the smallest possible compression. Bit-depth, color space, and dpi/dpc should remain the same as the digital master. Scale to prevailing screen/monitor resolution width to mitigate horizontal scrolling, i.e., not less that 630 pixels wide. Thumbnails may be scaled to dimensions appropriate for display

Table 6.1: Measures of digital resolution

Digital Resolution	
DPI= Dots per inch	DPI=2.54 x DPC
DPC=Dots per centimeter	DPC=DPI/2.54

Table 6.2: Suggested scanning guidelines

Master Digital Object	**Text**	**File format**	**Images**	**File format**
Machine-printed text	300 dpi	ITU TIFF Uncompressed	600 dpi	ITU TIFF Uncompressed
Grayscale (i.e. handwritten)	300 dpi	ITU TIFF Uncompressed	600 dpi	ITU TIFF Uncompressed
Color	300 dpi	ITU TIFF Uncompressed	600 dpi	ITU TIFF Uncompressed
Access Digital Object				
Machine-printed text	100 dpi	JPEG	100 dpi	JPEG
Grayscale (i.e. handwritten)	100 dpi	JPEG	100 dpi	JPEG
Color	100 dpi	JPEG	100 dpi	JPEG

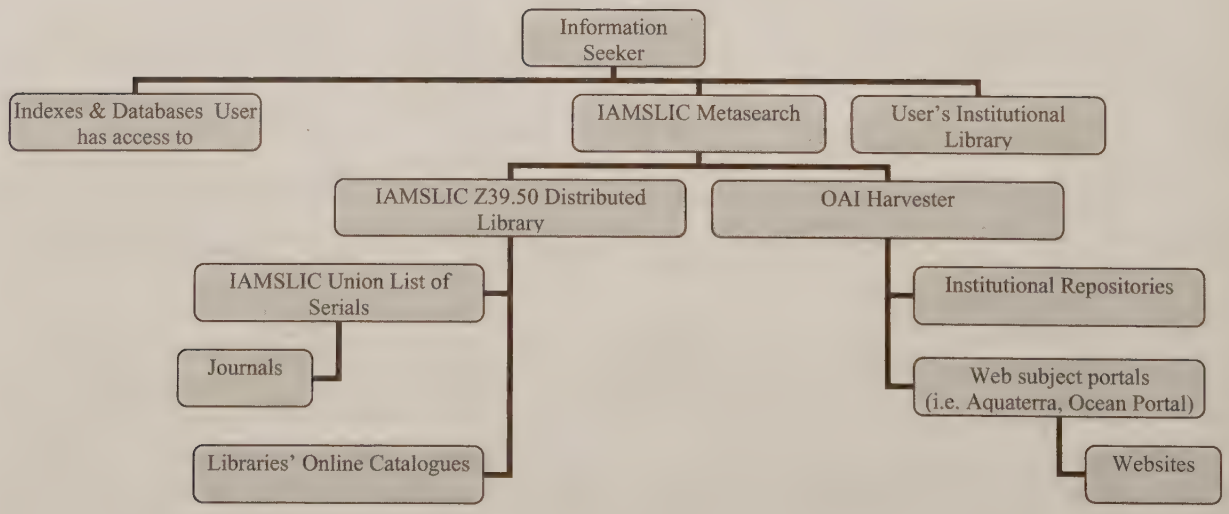
Components of a digital framework to improve access to fisheries and aquaculture information emerge continually. Simultaneously, the foundation elements strengthen with time and use. IAMSLIC members work in a broad range of organizations and institutions, each with a unique approach to the digital environment and with unique information resources. Linking the components together along with the institutional information resources is challenging. IAMSLIC promotes the use of standard methodologies such as Dublin Core for basic metadata, MARC, Z39.50 as well as XML for data exchange, and Open Source software as appropriate. It also urges members to comply with the spirit of the Open Archives Initiative by recognizing the importance of interoperability standards for enhancing access to the variety of fisheries information.

IAMSLIC's desired digital framework incorporates existing resources while allowing for inclusion of those to come. As more OAI-compliant resources emerge, IAMSLIC will implement a harvester to collect distributed metadata and provide access to institutional repositories, as well as metadata harvested from the *Aqua Terra* web portal. Diagram 6.1 illustrates how resources and services could be linked through a meta-search interface. This could potentially enable a single search across ASFA, the Z39.50 Distributed Library, CWIS web portals, and both OAI-compliant institutional repositories and information services. Building and maintaining such a system requires commitment by IAMSLIC members, the willingness of their institutions to support this endeavor with time and resources, and the involvement of a range of partners including FAO. Technical issues are not insurmountable, but need time and expertise applied to them.

IAMSLIC members also will continue to participate in other projects that can inform the development of the framework and ultimately improve its use. One example is IOC's work on an institutional repository for African fisheries and oceanography information. Another need is for more work on improving cross language harvesting of digital publications.

IAMSLIC is proving to be an excellent forum for the discussion on improving access to fisheries information internationally. It utilizes its members' expertise and enthusiasm to provide more ways for fisheries libraries to collaborate.

Diagram 6.1: Potential IAMSLIC digital framework



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